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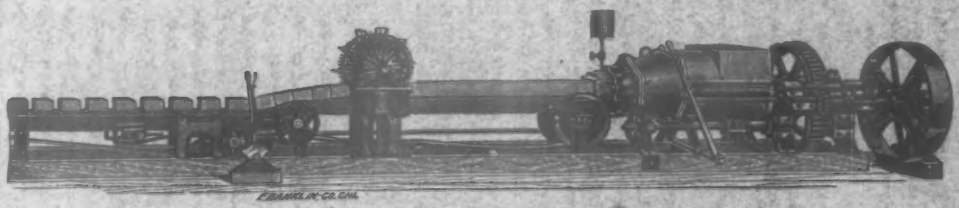

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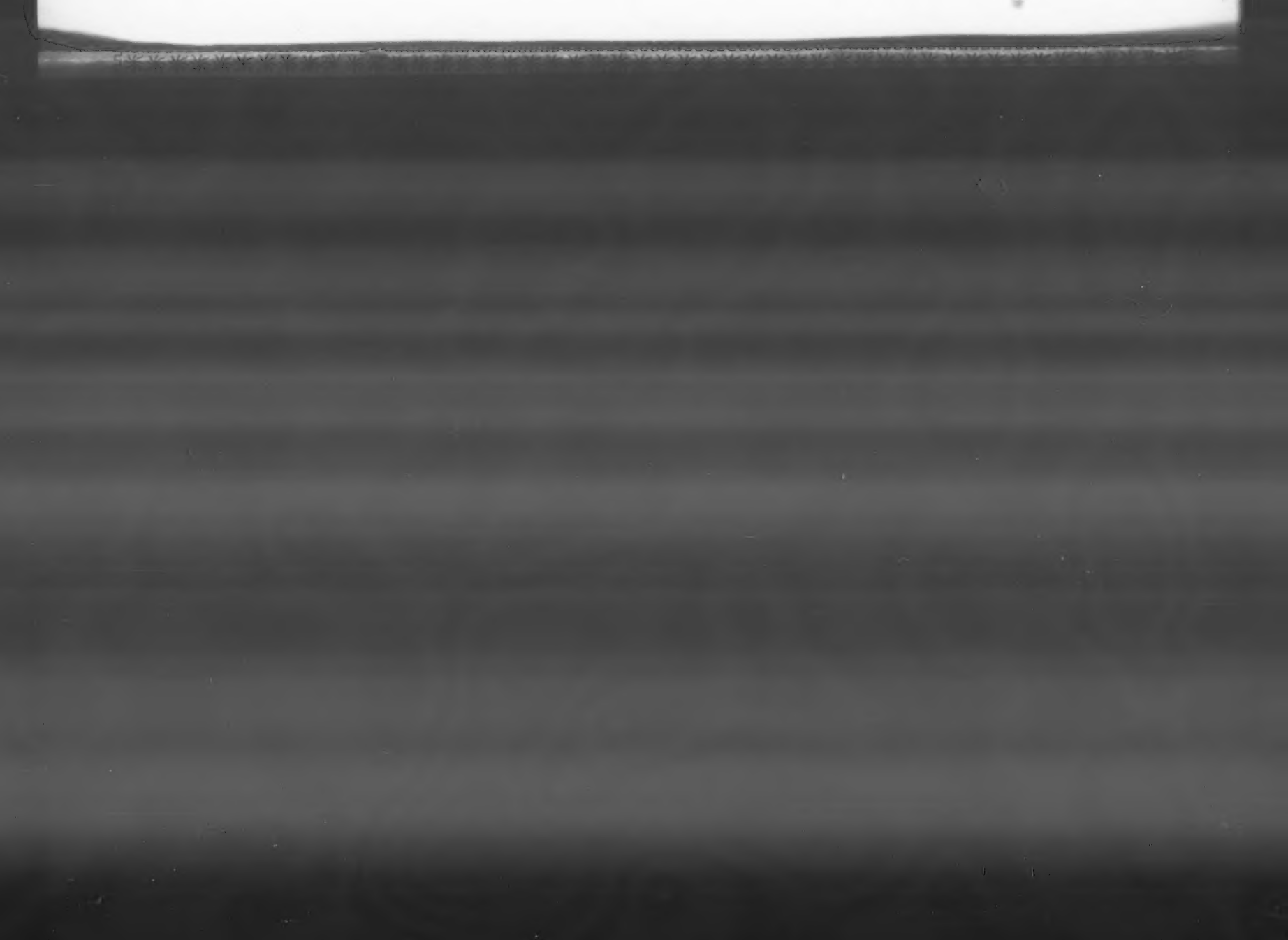

Paving and Municipal Engineering

VOLUME VIII. JANUARY, EIGHTEEN NINETY-FIVE. NUMBER 1.

THE BENEFITS OF STREET PAVING.

In no political division is it so important to shape public affairs solely in the interests of the entire community as in municipal government. The first tendency in town organizations is to make public improvements of every kind at the expense of the common purse. Nor does it seem practicable to pursue a different method in the formative period of a city's career. Yet it is manifest that such a policy necessarily benefits a few at the expense of the many, the advantages to the many being essentially incidental.

The "laying out" of town plats is usually a private enterprise. A few persons associate themselves together and purchase land in a locality whose natural resources under the magic touch of industry assure the development of wealth. Sites are given for courts, for town halls, for market spaces, for churches, for school buildings; streets are laid off and donated; blocks are set apart for parks, and other steps are taken by the proprietors of the land, according to their intelligence and foresight, to lay the foundations of a prosperous community. On their part the whole enterprise is speculative. They expect to realize large profits on the sale of their land in small parcels or "lots" to a multitude of people attracted to the town by judicious advertising. In its earliest stage the outlay is largely at the cost of the proprietors. But it is expended upon improvements intended to be profitable in themselves, while bringing to the town an industrious population. They build a sawmill, or a foundry, or an iron furnace, or a flouring mill, or all of these if the raw material in the immediate environment justifies their construction. Hundreds of laborers in these various industries are lured to the new settlement by the promise of steady employment at good wages

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with a low cost of living. The banker, the tradesman, the weekly paper—all the activities that are necessary to make a town, soon find a field for development within its limits, and so the town "grows" from a handful of land speculators and "promoters" to a community of a few thousands. Up to this time the chief drain has been upon the original proprietors, although if they are prudent men their money has been spent in investments self-sustaining from the first. They have located the "business center" of the town and have retained for themselves the lion's share of ground in this always favored locality. They own the choicest lots on the chief business street, and when the town has reached the point where street improvements must be undertaken, of course the first street to be lifted out of the mud and dust is the principal business street, and the cost of this improvement is charged up against all of the property in the town, that is, it is taken out of the general fund raised by the taxation of all the property-holders.

There is no protest against this from any source. The owners of property on the favored street of course make no objections, while public spirit, always more noticeable in the early history of a town, willingly and even enthusiastically applauds the first step toward an improvement of its physical appearance and condition. Later on other streets in the "business center" are paved on the same plan and the expenditure out of the general fund is excused on the same ground. If a few persons living on streets outside of the "business center" begin to protest ever so feebly against paying for the improvement on other streets, while those on which they own property are left knee-deep in mud in winter and ankle-deep in dust in summer, they are silenced by organized opposition of the property-holders in the favored locality, who with the cry, "we must have paved streets if we are to have a city," backed by the able editorials of the weekly paper, easily revive public spirit and the work of improvement goes on at the public expense until the principal streets in the "business center" are all paved.

At this stage in the growth of the town the demand for improved streets invariably declines. The "business center" has been taken care of; the property of its paved streets, owned by a few, has been so enormously increased in value that it pays at least one-half and oftener two-thirds, of the taxes of the town, and the

influences that were all-powerful in inaugurating street-paving are now directed against its continuance. In vain do property-owners in other parts of the city petition the town council year after year for paved streets. Yet if the town is favorably located it continues to grow despite the cessation of street improvements, and after a while the clamor of property-holders outside the business center grows so strong and their voting strength so increases that they succeed in electing a council pledged to street improvements in the outlying districts.

But the large tax-payers do not abate their opposition. The council is against them on the main question and they no longer array themselves against continuous street improvements. Their position now is that "outside streets" do not require the best class of paving; that gravel or broken rock will answer very well for these; that not more than one-third of the cost should be taken from the general fund, and that two-thirds should be paid by abutting property. They meet the objection that as the streets in the business center have been paid for by all the people, fair play demands that this policy shall be continued, with the argument that the paving of the principal business streets has established the future of the town and has largely enhanced the value of all property within its limits; in a word, that all have shared, proportionately to their holdings, in the general prosperity. There is sufficient truth in this contention to disorganize the ranks of those opposed to it, and the policy of "cheap" gravel or macadam streets, and a division of their cost between the town treasury and abutting property in the ratio of one-third to two-thirds is established.

But a few years' experience with these "cheap" streets discloses that they are the most expensive of all known methods of paving. The first cost is less in towns situated near gravel beds or limestone quarries, but the cost of repairs is enormously greater than in any other kind of street surfacing. A few years ago, urging their abandonment in the city of Evansville, I showed by the record of fifteen years that the expenditure for repairs of gravel streets began within thirty days after their acceptance by the city and amounted in every four years and nine months to as much as the orginal cost of laying them. That is, in the city of Evansville, with inexhaust-

ible gravel beds less than five miles distant, the life of a gravel street was only four years and nine months.

Not only do the people discover that gravel and macadam streets are more expensive in the period of fifteen years, but they see that if the streets are more solid in winter they are not free from mud, while in summer the dust is still insufferable. They have paid their money and have the mud and dust still. They see the clean paved streets in the business center for which they helped to pay and they are dissatisfied. But they also see the hopelessness of a fight for a restoration of the plan of paying the entire cost out of the general fund. The large property-holders will be more aggressive than ever in opposing it. Above all it is apparent to every thoughtful person that if this plan is restored, general taxes must be greatly increased, and even with such increase the work of street paving must creep along at a snail's pace. They have also observed that the revenues from property on paved streets are proportionately much higher than even on graveled streets. And so they reach the point when, dismissing all that has passed as not practicable as precedents, they assert, for the first time, the true principle that should govern all improvements made by municipal authority: "Pay for what you get, and only for what you get."

This declaration of independence marks the beginning of a new era in the history of the town that enforces it. It puts an end to the practice, inseparable from the early stages of the town's growth, of building up private property at the expense of the public treasury. It relieves the general fund of all charges except those manifestly for the common welfare. If property-holders on a given street want a brick or an asphalt pavement, they can have it without waiting until they are gray, and without the cost of a dollar to the general tax-payer. All are placed upon an equal footing, and the rapidity with which the streets are paved is commensurate with the intelligence of the people owning property abutting thereon. They are to pay for the work, and it is for them to say whether or not it shall be done. Nor can there be a doubt of their ultimate decision. We have already seen that property fronting on brick streets rents for more and commands a better class of tenants than property on unpaved streets only a block distant. Self-interest stimulates the

work, and the "kicker" of yesterday, moved by his decreasing rent roll, because of the mud and dust in front of his property, becomes the most persistent to-day in his demands for a metalled street. He is not only willing to pay for it, but he has been educated a step upward toward the hights of civilization. He has learned the greatest of all lessons in life, that one owes it to the community in which he lives, not less than to himself, even if he have but one talent, not to hide it away if he would escape the consequences that surely overtake the selfish and greedy sooner or later.

He has learned that in any plan of public improvements relying upon revenues collected from the community as a whole, the small property-holder is always at a disadvantage; that he is ever paying for the improvement of somebody else's property, and that he must wait until his wealthier and more influential neighbors are served before his turn comes for direct benefits. With the policy of charging to abutting property the entire cost of street improvements, he has equal chance with the best. If he is willing to pay for what he gets out of his own pocket, he gets it. Nor is the individual the one who is alone benefited by this policy. Relieved of any share in the cost of street improvements, the city authorities can respond to the demands for street improvements as fast as they are made. The city's thoroughfares are completely paved within a few years. It soon becomes known everywhere for its enterprise and for the intelligence of its people. Strangers are attracted to it for these reasons, and because of the cleanliness and favorable sanitary conditions usually found in every city where streets and alleys are metalled.

The history of every town in the West that has laid down brick streets in recent years shows a large increase in population and wealth, dating from the inauguration of this enterprise. The results of this particular kind of street surfacing are more noticeable, because, having been introduced in this country within the past twenty years, many cities have simultaneously availed themselves of brick paving on account of its cheapness as compared with other paving materials long in vogue. From all of them comes the same story. Cities that had been languishing for a decade took on new life and vigor when brick streets changed not only their appearance, but their character. Public spirit was revived. Pride in the town

was re-awakened, and hope took the place of despondency. The clean, paved streets were followed by stone sidewalks, and, in the residence portions, by strips of green sward between them and the street running its entire length. No one thing illustrates the civilizing effect of paved streets more forcibly than the care bestowed upon these glimpses of green along the city's thoroughfares, and the rivalry between neighbors to cultivate them with all the care bestowed on the lawns in front of their residences. Even the streets themselves are swept daily in front of residences by the household "help," to put a polish, so to speak, upon the work of the street-sweeping contractor.

In the business center handsome buildings are constructed. The fronts of old buildings that were "plenty good enough" as the framing for mud and dust streets, now look shabby and are torn away to give place to pressed brick and terra cotta, stone or marble. Here and there some penurious rich man—all cities know him, alas, too well—mars the general outline with an oyster-can front, but the popular protest is so relentless, and the preference given to genuine architecture by high-class tenants so marked, that the days of sham facades with their tawdry ornamentation are numbered.

Public buildings cease to be planned only to meet the wants of the immediate future, but are monumental of an era that proclaims the city's regeneration. The spirit of cleanliness pervades the community. Alleys are relieved of their reeking filth. Sidewalks are swept and scrubbed. Public opinion becomes more exacting of individual responsibility to the common weal. One's relation to the community is no longer "nobody's business but his own as long as he behaves himself." It is the business of the community to insist that every citizen shall not only keep abreast of the new standards of enterprise that paved streets have established, but that he shall strive to advance them whenever he lays one brick or one stone upon another for his own profit.

But it is not alone the physical condition of a city that is improved by the metalling of its streets. The character of its people is also elevated. I do not doubt that an examination of the criminal statistics would disclose a considerable decrease in that class of misdemeanors that can be readily traced to unwholesome surroundings. Certainly great advancement may be noticed in the dress and bear-

ing of a people that have banished dust and mud from their streets. Their homes are cleaner because it is easier to keep them clean. The cost of living is sensibly reduced, for clothes can be made to look presentable much longer when the offal of the city is not continually wafted in at the windows and doors, or deposited in clouds upon the persons of those engaged in open air avocations. There is also marked development of amiability as one of the chief characteristics of a people whose streets are paved and swept. There is less temptation to profanity. We must even believe that the religious sentiment is exalted, for the principal excuse for non-attendance at church in bad weather is removed. There is no mud to wade through to reach the doors of the sanctuary, even on the rainiest day, and the rain in itself is not likely to deter the just from discharging their obligations, especially when they may console themselves in the consciousness that the unjust are out in the shower too. The family Bible with its covers free from dust will be read oftener. Its lessons of humanity will find lodgment in many a heart now unfamiliar with the sentiment of brotherly love that pervades all the utterances of the Nazarene like a blessed benediction. It will learn that the first of all these teaches that no man can live nobly who lives for himself alone, and that concern for the common welfare is not only the highest expression of enlightenment, but is followed by the highest rewards. *George W. Shanklin.*

GEORGE WILLIAM SHANKLIN has been an editorial writer on the Evansville *Courier* for the past twenty years. He has given special attention to the study of economics, and has devoted his life to the upbuilding of Evansville. He may be said to be the pioneer in the work of municipal reform in Indiana, for before the first metropolitan police law was enacted the Evansville *Courier* had succeeded in bringing about the establishment of the police department of Evansville on a bi-partisan basis. A few years later the same policy was applied to the fire department of that city as the result of a vigorous city campaign, in which the ticket supported by the *Courier* was elected on the affirmative of that issue. Six years ago Mr. Shanklin began advocating the laying of brick streets, and although there was strong opposition, including that of the other daily papers, the proposition carried, and Evansville now has nearly fifteen miles of brick streets completed and to be completed in 1895. Mr. Shanklin was appointed chairman of a special committee of the Business Men's Association four years ago to prepare a city charter, and the work was left entirely in his hands by his colleagues. It was not favorably received, however, by the city council then in power, and was therefore not presented to the legislature at that time. Two years ago the demand for a new charter was re-

vived, and substantially the charter originally prepared by Mr. Shanklin was enacted and is now the law. Mr. Shanklin was also one of the chief factors in securing a street railroad charter for Evansville based upon the principle that public franchises should be fruitful sources of revenue. He is a strong advocate of ownership by the people of all natural monopolies and of the exemption from taxation of all improvements on real estate.

HIGHWAY IMPROVEMENT IN MASSACHUSETTS.

No STATE in the union has taken such advanced steps in road building and none has gone about the solution of the road problem in a more scientific spirit than Massachusetts. A law was passed some years ago, authorizing the appointment of a commission of inquiry by the governor, and upon the recommendations of that commission the present law is based.

In brief, the law provides for the construction of roads at state expense, the sum paid to be taken out of a fund appropriated annually. This money is expended by a commission, holding office under appointment of the governor for three years, the term of one commission expiring each year. Two-thirds the expense will eventually be assessed upon the counties in which the roads are built, but the state must maintain them forever.

The commission, consisting of George A. Perkins, late chief consul of the Massachusetts division of the League of American Wheelmen, chairman; W. E. McClintock, engineer, and Prof. N. S. Shaler, of Harvard University, scientist, is a strong organization. The work has been lined out on a comprehensive scale, looking to the welfare of the state as a whole, as well as particular localities. Work is in progress in twenty-seven towns, scattered through every county in the state, on widely varying conditions of surface and grade. So far the work has been laid out in mile stretches here and there, to the casual observer an incoherent patchwork of good roads scattered over a vast labyrinth of sandy and rocky paths. Yet when examined closely these separated bits are seen to be parts of a great whole, which will eventually make the main arteries a system of unsurpassed roads centering in Boston, and connecting all the larger towns in the state. It is not unlike the old Roman plan, excepting in the details of construction.

To secure state aid a county must petition through its commis-

sioners or a town through its selectmen. It does no good for cities to petition, for the commission decided at first that cities were able to care for their streets, though cities pay a large per cent. of the cost. The commission argues that cities get the cost back in additional business secured through improved roads. When the county commissioners present their petitions the state commission appoints a hearing. It is notable that all hearings have been attended by large numbers of spectators, indicating something of the interest taken by individuals in this question. Frequently there are

EFFECT OF NARROW TIRES ON AN UNDRAINED ROAD.

presented the claims of different locations, between which the commission must decide. Invariably its decisions have been satisfactory, because it has attempted to spend its first appropriation where it would do most good and benefit most people. Obviously this is impossible occasionally, but usually there is no difficulty. The hearings are lively, but when each location has had its claims presented and the commission has decided, there is no further discussion, the people knowing full well they will have their share later.

After location has been decided upon careful surveys are made. Mr. McClintock generally directs these surveys, which so far have been made under the personal supervision of Mr. Charles Mills,

the chief engineer in charge. The grade is fixed, the width of the road, the amount of earth and rock to be removed, are carefully marked, the exact percentage of earth to be taken away from one side and placed on the other, the number and character of the culverts, the places where French drains will be necessary, and profiles every fifty or one hundred feet are marked. Any engineer can take the papers and build the road. No guess work is allowed, the aim being to know exactly what is done, and how much it costs to do it.

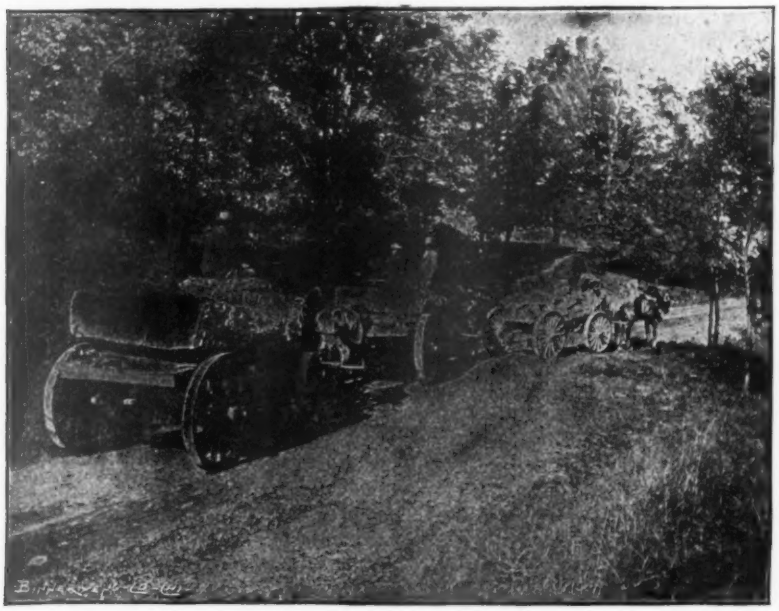
Wherever work has begun the contract has been let to a town. The commission believes that towns should have the benefit of the money expended in keeping their unemployed at work, and no contracts have been let to outside parties. Another point sought is the education of men in each town to fit them for the work and teach them the science of maintenance so they can care for the roads when once built. A marked feature is the enthusiasm of the men employed and the great interest manifested by all the people of a town in its progress. Where least expected enthusiastic constructors have been developed who have shown extraordinary knowledge of the common-sense principles of road building, and who will, when the state highways are finally completed, be, to all intents and purposes, scientific men, capable of doing ordinary road work after the engineer has made surveys. The educative portion of the commissioner's work, in this respect, is of more value to the state than the roads themselves, and it is of a sort which will increase rather than diminish as road building continues. If the commission had not adopted this plan of education the roads would have been ruined in a short time because of inattention. As it is, an immense corps of capable, practical men is being formed, who will care for the roads fully as well as men with a purely scientific education would do.

Usually the men selected have had some experience in road building under the old systems. The commission has found them quick to appreciate the advantages offered, and have sought diligently to master details. If the Massachusetts experiment succeeds, and there is no reason why it should fail, these men will be in demand elsewhere.

The methods of construction are based upon approved scientific principles. All grades are uniform and nothing above seven per

cent. is allowed. On level, the road-beds are eighteen feet wide; in the mountains fifteen feet. None are built less, but some are more. The aim is to have a road sufficiently wide for two or more teams to drive abreast without danger of collision.

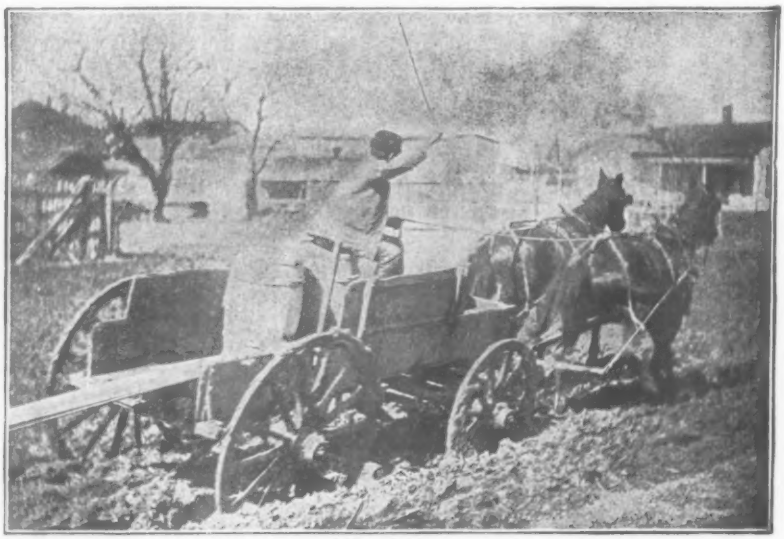
The situations determined and the grades fixed, excavation begins. In wet localities the road-bed is excavated to the depth of a foot or more; in dry only a few inches, or perhaps not at all. If wet, a foundation of Telford is laid to insure perfect drainage.



HAULING STONE ON WIDE TIRES.

Sometimes live gravel is spread on the bottom of the excavation for a foundation for the Telford; often not. On top of the Telford is spread a layer of crushed trap-rock small enough to go through a two and one-half inch screen. A heavy roller is put on, and the trap rolled perfectly solid. Another layer, composed of rock about half as large as the first, is spread and rolled again. The third layer is the size of small gravel, and when the rolling is finished the road is as hard and almost as compact as if it were cemented. The result is a perfect road, hard and smooth, and always the same whatever the weather may be.

This is a brief description of actual work. Varying in different localities, prices also vary, so that work in each town must be estimated singly. In the mountains, where bubbling springs and sliding banks have made roads dangerous, if not impassable, the cost is much greater than on level, where less excavating, cutting and filling must be done. Telford base is expensive compared with gravel. Further, perfect drainage in mountain districts is only obtainable by laying culverts from fifty to one hundred feet apart. French drains are also necessary in some places and all increase



A CLAY ROAD IN SPRING.

expense. The culverts are built of substantial masonry, two feet square, so that a man can go in and clean them, if by any means they become clogged. The old culverts, only a few inches square, filled with leaves if a stick caught across the opening, and the surplus water spread itself all over the road. No state road can be injured that way because the passage is large enough to carry the water and debris away.

So far the cost has varied from $7,000 to $13,000 a mile, representing the minimum and maximum expenditures. The towns in which the roads are laid have taken the contracts and figuring has been so close that all have come within the contract price.

So many elements enter into the cost that it is impossible to itemize it. In one place crushed stone can be secured for half what it can elsewhere.

Excavating costs heavily in one place and less in another, making close estimation impossible unless one takes each piece separately. Speaking in a general way, level roads will seldom cost over $8,000 a mile, while mountain roads may go as high as $15,000, but so far none have reached the higher figure.

What people elsewhere want to know is can the State afford to

AN UNIMPROVED SAND ROAD.

do this, and continue until a network covers Massachusetts? That is, will the increased valuation be sufficient to warrant this immense expenditure? Without question the state can afford to expend $500,000 a year. Taxable property will increase in value sufficiently to warrant the extra cost, though that doesn't seem possible. Already some farmers are holding their property at from twenty to twenty-five per cent. higher than before the new road was constructed alongside their property. If even a smaller percentage holds good all over the state, the expense incurred will be repaid many fold.

One more point remains to be touched upon, namely, mainte-

nance. People are making the mistake of thinking that these roads once built will need no repairs for years. This is untrue. The same vigilance exercised by railroad companies will be exercised. By the terms of the act the state must keep up repairs. That means an annual appropriation of hundreds of thousands of dollars after construction is completed. Repair sections must be established and an inspector must go over the ground every day, otherwise slight imperfections will lead to costly breaks.

The question of maintenance is of more importance than construction. Everybody favors building because they appreciate the benefits; but these enthusiastic individuals think such a road once built is done forever, ignoring the need of constant touches here and there to maintain it. These points must be taught the people so that the best results of the commissioner's work will not be ruined by leaving it to go to ruin after completion.

Other states will do well to copy this act with such modifications as may be required and experience dictates. It is the most practical, the most comprehensive and most effectual highway law ever enacted in the United States. *Burton H. Allbee.*

BURTON H. ALLBEE was born in Andover, Vt., on February 9, 1866. He is a journalist who has had varied experience, and has done some notable work. His editorial connections have been with eastern newspapers and periodicals, with the exception of about two years spent in Indianapolis as editor of *Milling* and also of *Stone*, and later with the Indianapolis *Sentinel*. He is at present managing editor of the Springfield *Homestead*, the leading weekly newspaper of Massachusetts. He is a man of extraordinary intellectual activity, and the improvement of the highways of the country is one of the subjects in which he has been greatly interested.

THE FLOW OF WATER THROUGH GLAZED PIPES.

AS THE use of Kutter's Formula for the co-efficient C in the formula $C\sqrt{RS}$ has become general among engineers, on account of its utility and applicability to nearly all forms, materials of construction and slopes of conduits, I will try to give a convenient form for its application.

The calculated velocity of water in feet per second by the above formula, through pipes of given diameter, at different slopes, can be graphically represented by points which lie in a parabola. After calculating the velocity for an assumed slope, any intermediate ve-

locity or slope can be calculated by the formula a^2b for the co-ordinates to the parabola; where b=height of the parabola (or slope

Diam.	Circumf.	Square ft.	Hydraulic radius	Slope	Coeff. n	C	$\sqrt{s}$	Velocity
5"	1.309	0.136	.104	0.10	.011	953	.1019	8.70
6"	1.571	0.196	.125	.	.	999	1118	10.95
7"	1.833	0.267	.146	.	.	998	1208	11.33
8"	2.094	0.349	.167	.	.	973	1292	12.57
9"	2.356	0.442	.188	.	.	1003	1371	13.76
10"	2.618	0.545	.208	.	.	1034	1443	14.91
12"	3.142	0.785	.250	.	.	1076	1581	17.01
14"	3.665	1.069	.292	.	.	1116	1709	19.07
15"	3.927	1.227	.313	.	.	1134	1769	20.06
18"	4.712	1.767	.375	.	.	1179	1936	22.84
20"	5.236	2.182	.416	.	.	1206	2039	24.59
24"	6.498	2.405	.438	.	.	1219	2090	25.48
28"	5.760	3.640	.458	.	.	1231	2140	26.34
24"	6.283	3.142	.500	.	.	1252	2236	27.99
30"	7.854	4.909	.625	.	.	1396	2500	32.65

Table No. 1.

in this case) and a=a fraction of the velocity at slope b, or fraction of an ordinate to the parabola.

Diam. of pipe	1	2	3	4	5	6	7	8	9	10
	a = fraction of max. ord. to parabola, or fraction of vel. at slope of 10' per 100									
	.1	.2	.3	.4	.5	.6	.7	.8	.9	1.0
5"	0.87	1.74	2.61	3.48	4.35	5.22	6.09	6.96	7.83	8.70
6"	1.01	2.01	3.02	4.02	5.03	6.03	7.04	8.04	9.05	10.05
7"	1.13	2.27	3.40	4.53	5.67	6.80	7.93	9.06	10.20	11.33
8"	1.26	2.51	3.77	5.03	6.29	7.54	8.80	10.06	11.31	12.57
9"	1.38	2.75	4.13	5.50	6.88	8.26	9.63	11.01	12.38	13.76
10"	1.49	2.98	4.47	5.96	7.46	8.95	10.44	11.93	13.42	14.91
12"	1.70	3.40	5.10	6.80	8.51	10.21	11.91	13.61	15.31	17.01
14"	1.91	3.81	5.72	7.63	9.54	11.44	13.35	15.26	17.16	19.07
15"	2.01	4.01	6.02	8.03	10.03	12.04	14.04	16.05	18.05	20.06
18"	2.28	4.57	6.85	9.14	11.42	13.70	15.99	18.27	20.56	22.84
20"	2.46	4.92	7.38	9.84	12.30	14.75	17.21	19.67	22.13	24.59
21"	2.53	5.10	7.64	10.19	12.74	15.29	17.84	20.38	22.93	25.48
22"	2.63	5.27	7.90	10.54	13.17	15.80	18.44	21.07	23.71	26.34
24"	2.70	5.40	8.10	11.20	14.00	16.79	19.59	22.39	25.19	27.99
30"	3.27	6.53	9.80	13.06	16.33	19.59	22.86	26.12	29.40	32.65
	.1	.4	.9	.16	.25	.36	.49	.64	.81	1.0
	a^2b = Abscissa, or slopes giving above velocities.									

Table No. 2

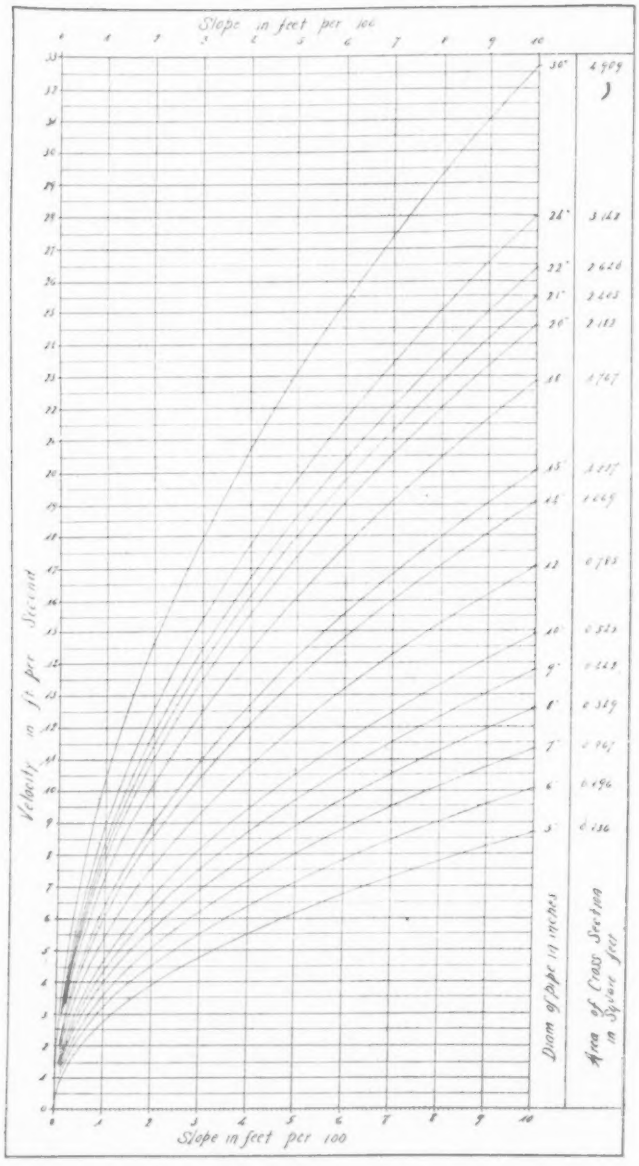


DIAGRAM Showing Velocity &c of Water in Sewer Pipes.
When running full
at slopes from 0 to 10 ft per 100

An example will be given in explanation:

$$C=\frac{41.6+\frac{.00281}{S}+\frac{1.811}{n}}{1+\frac{\left(41.6+\frac{.00281}{S}\right)^{n}}{\sqrt{R}}}$$

S=Slope, n=co-efficient of roughness of the material with which the pipe or conduit is constructed (here taken as .011).

R=Hydraulic radius and for pipes of circular section when running full= $\frac{\text{Diam. in. ft.}}{4}$

Using these data the above formula applied to a 12 inch pipe at a slope of 10 feet per 100 becomes—

$$C=\frac{206.264}{1+\frac{.457908}{\sqrt{.25}}}=107.6 \text{ and } 107.6\sqrt{RS}=17.01 \text{ velocity in feet per second.}$$

This having the velocity = the ordinate to the parabola and the slope, *i. e.*, 10 ft. = the height; we can easily draw the parabola either graphically or by the use of Table No. 2. As the graphical method is explained in nearly all text-books on drawing, no explanation will be given here.

Enough only of the intermediate velocities or co-ordinates will be calculated to keep the points on the diagram near enough together for convenience in drawing the curves. The ordinate a=17.01 has been divided into ten equal parts, 1.70 in col. 1, 3.40 in col. 2, etc., a^2b=0.1 placed under col. 1; 0.4 under col. 2; 0.9 under col. 3, etc., giving the slopes which produce the velocities above.

Next to draw the diagram, lay off spaces, to any convenient scale, equal to the slopes given at the foot of the table; erect perpendiculars from these points equal to the velocities given in the body of the table to any scale. Draw the curve through the points thus found, using a parabolic curve or other equally accurate instrument.

The use of Table No. 1 is obvious, and needs no explanation.

The explanation of Table No. 2 is probably given in too much detail, but as it is chiefly intended for those unfamiliar with the properties of the parabola, it is thought permissible on that account.

Emmett Steece, C. E.

MUNICIPAL OWNERSHIP OF STREET-LIGHTING PLANTS.*

It is proposed that street lighting works be owned and operated by the municipal corporation, and many cities and towns have been considering the advisability of the plan. The question has been hotly argued on both sides, and it is to be regretted that these discussions are not always conducted in a fair-minded, liberal manner. Arguments advanced by men interested in private lighting companies are denounced by their opponents as prejudiced opinions; the cry of "monopolist" is raised to enlist public favor on the side of municipal ownership, and the same offense is thus committed as is charged. It is but natural that persons having capital invested in any particular enterprise should strive to protect their investments, especially in a case of so serious a nature where the threatened danger means inevitable destruction. On the other hand there is much to show that the arguments put forth by the advocates of municipal ownership are not always inspired by pure and unselfish motives. If these discussions are to accomplish any good the opinions advanced by either side must be honest and unbiased, and above all the facts and figures cited must be truthful, for the outcome of the case really hinges thereon.

The burden of proof lies with the advocates of municipal ownership, and the arguments in favor of their claim are identical with those of the complete scheme of government ownership.

Can a municipal corporation perform its own lighting service cheaper than a private company can supply it? Figures are given showing the cost of the service where the plant is owned and operated by the municipality, and estimates are made on the cost of building and operating proposed plants, nearly all of which are so surprisingly low that they must at once arouse suspicion in the minds of thoughtful men. According to these reports the cost of public lighting, where it is done by the municipality, averages about one-half of the price usually paid to private companies. One town in Illinois, having 120 electric lamps on its streets, even reports that these cost nothing, that the expenses of operating are all paid by the profit received from commercial lighting. It is a significant fact, how-

*Abstract of paper read at the meeting of the Canadian Electrical Association, Montreal, September 19, 20 and 21.

ever, that these figures rarely represent the actual total cost. There is a tendency on the part of the advocates of municipal ownership to underestimate or entirely ignore any items which are not cash actually paid out, such as depreciation in value of plant due to wear and tear, and to the fact that new and improved apparatus and methods are constantly coming into use, interest on capital invested, insurance, taxes, and in some cases water supply. The town treasurer's statement of expenditures incurred in operation is often the only outlay considered, and even this may be incomplete, since municipal authorities do not always analyze accounts so as to show a full statement for each department. Insurance and similar expenses may be debited to separate ledger accounts and not appear at all in the statement of a particular department. Other items are charged to the department where they belong, but under the wrong heading. As a case in point, we may cite the financial statement of Toronto Junction for 1893. Under receipts and disbursements authorized by by-laws for issuing debentures on account of electric light construction, we find an item for rebuilding engine bed of $162.93. This was a repair and properly belongs to maintenance.

Now, it is plainly unfair to compare such figures with those paid to private companies and say that a municipality operating its own plant saves the difference. To compare results intelligently we must agree on a basis of comparison. If the price paid a private company is remunerative to them, it includes depreciation, interest, insurance and taxes, and we must therefore debit a municipal plant therewith. The municipality may for a number of years persuade itself to believe that these expenses are imaginary, but it must meet them in the end, and no matter to which account they are charged, they are incurred by the lighting plant.

Many cities and towns have been persuaded by incomplete reports and alluring estimates to undertake the experiment, but it still remains to be proven that a municipal plant can supply a cheaper light than a private company. In towns which are not large enough to make business remunerative the installation of a plant by the corporation may be justified, because street-lighting is a public necessity; but where private plants already exist that are able and willing to supply the municipality at a fair price, the outlay can not be regarded otherwise than as an unnecessary expenditure and a waste of public money. *E. Carl Berithaupt.*

TECHNICAL ANALYSIS OF ASPHALTUM.*

It requires no argument to prove, to any one at all familiar with the subject, that petroline is nothing but a name that covers a great variety of substances, radically unlike, that exist in different forms of bitumen, and are only related, in this instance, as being held in solution by a certain limited number of menstrua and which include the whole list of paraffines and iso-paraffines, the olefines, the benzines and additive benzines, with many other less abundant and well-known substances.

Ethyl ether and so-called petroleum naphtha, which latter is an indefinite mixture of fluid paraffines and iso-paraffines of high specific gravity, are the solvents used; but no determination has been made as to the influence of proportion in the mixtures of the substances dissolved, or as to the relative solvent powers of the two menstrua upon the different constituents of these mixtures. In fact, petroline is nothing but a name which at present covers a vast expanse of the unknown.

It can be safely said that probability favors the assumption that asphaltine is a little more definite; but no certainty attaches to the identity of asphaltine from different sources or of asphaltine dissolved by different menstrua.

Therefore, in a general way, it may be said that asphaltine is that portion of the different forms of bitumen that is soluble in carbon disulphide, chloroform, benzine, and a few other less well-known liquids, and is not soluble in the menstrua that dissolve petroline.

As the bitumens examined by the French chemists, above mentioned, have never assumed commercial importance, the questions relating to petroline and asphaltine have remained matters of scientific interest only. However, since asphalt paving has become a business involving the expenditure of large sums of money, these problems are beginning to assume a wide importance outside the laboratory of the chemist and to demand from technologists very serious consideration. Within recent years large numbers of so-called analyses have been reported, which represent various at-

*Abstract from the *Journal of the American Chemical Society.*

tempts to determine and set forth the relative value of many samples and kinds of asphaltum, that may or may not be suitable for the many uses to which asphaltum is applied, but more particularly with reference to street paving. Prominent among the chemists who have been more or less extensively engaged in these analyses of asphalts are Mr. Clifford Richardson, Dr. Henry Leffmann, Dr. Samuel P. Sadtler, and Dr. De Smedt.

A perusal of the numerous published reports of Mr. Richardson reveals the fact that in his tests the solvents used for the extraction of petroline and asphaltine were petroleum ether and carbon disulphide, while Drs. Leffmann and Sadtler, in their investigations and tests of asphalts, used alcohol—presumably ethyl-alcohol—carbon disulphide, and ether, as shown by the report submitted to the Citizens' Municipal Association and the Trades League of Philadelphia.

Neither of these gentlemen describe any process or method employed in obtaining the results stated. It is hardly consistent with the nature of the reports that they should. Nor has Mr. Richardson given any detailed description of the process he employed in order to obtain the numerous results of analysis that he there uses.

When we take into consideration the fact that turpentine, carbon disulphide, ether, chloroform, and benzine have been used indiscriminately by chemists in the extraction of asphaltine, the question very naturally arises, are the results that have been and that are being obtained by these different methods of analysis strictly comparable—that is, are they convertible terms? Will the same asphalt treated with different solvents show in each case the same percentage composition? If not, then it is evident that asphalt taken from different localities and subjected to dissimilar methods of analysis can not yield results of any value so far as purposes of comparison are concerned. Then, again, if turpentine, carbon disulphide, and chloroform give a different proportion of asphaltine in the same asphalt, it is just as evident that asphaltine, instead of being a definite chemical substance, is a mixture, which mixture would doubtless vary in different asphalts.

It was for the purpose of determining whether petroleum, ether (paraffines), California naptha, and ethyl ether are interchangeable solvents of petroline, and whether turpentine, carbon

disulphide and chloroform are interchangeable solvents of asphaltine, that the research, the results of which are here given, was undertaken. That a series of such tests, faithfully carried out, should lead to the establishment of a method of analysis applicable to all asphalts, and, at the same time, reveal something regarding the real nature of petroline and asphaltine was inevitable.

Of the twenty-three asphalts examined, there was not one that did not yield some asphaltine on treatment with chloroform; consequently it is safe to infer that in the analysis of asphalts, unless final washing be made with chloroform, the per cent. of asphaltine will be too low. There was a marked difference observed in the different asphalts as to the manner in which their constituent asphaltine was dissolved on treatment with hot turpentine.

While this research is in no sense complete—it has in fact but opened up a wide field for further work—yet, sufficient evidence has been obtained to show that the petroline and asphaltine are not substances, but empirical terms that designate mixtures of substances soluble under certain conditions in different menstrua.

It is not unfair to assume that in these empirical mixtures, so long known under the names of petroline and asphaltine, the lower members of all the different groups of hydrocarbons now known may be found. Again—just as some petroleums, which are varieties of bitumen, consist chiefly of paraffines—notably Pennsylvania petroleum—and some, like Russian petroleum, consist of the additive benzines, while still others contain mixtures of the two, is it not reasonable to presume that solid bitumens, like liquid bitumens, are equally variable in composition? If this be the case, then it is equally fair to assume that any solvent taken will not dissolve substances of identical composition from different asphalts.

A review of the results here given suggests the query, have the methods heretofore employed for the technical analysis of asphaltum really been analytical at all? Would not a method and process suggested by the results of the qualitative analyses given in this paper and based on the successive application of different solvents and yielding results similar to those of fractional distillation really become analytical, especially if the separate portions dissolved by

the different solvents were subjected to such treatment by oxidizing agents as would enable us, by a comparison of the products of oxidation, to determine to what groups of hydrocarbons the different substances dissolved respectively belong? *Laura A. Linton.*

A PAVING BRICK STANDARD.

THE question of uniformity in paving brick specifications should and doubtless will receive thorough consideration at the next meeting of the National Brick Manufacturers' Association. It is not within the power of the Association to determine what the specifications shall be, as that rests largely with the city engineers who have charge of the paving work, but it is a good starting-point for bringing about an acceptable solution of this problem. Mr. D. V. Purington has recently pointed out some of the important considerations for the manufacturers, and in discussing them from the engineer's point of view, Mr. D. W. Mead says:

"There are, however, many points which must be carefully considered before attempting to establish a standard. In the first place it must be remembered that although paving brick were first used in this country more than twenty years ago, yet their more general use is only within the last few years, and many cities have used them for the first time within the last year or contemplate their use for the first time within the year. The city engineers and other municipal officers are, therefore, in many places, largely ignorant in regard to what the requirement of a good paving brick should be, and where unfamiliar with this material personally, must select from the specifications used in other places, such as their good sense may dictate, with such variations as their fancy and desire for originality may demand. This state of affairs could no doubt be greatly improved by placing standard specifications in the hands of such engineers or others having to do with the construction of brick pavement, provided such specifications could come with sufficient moral authority to demand attention. Such specifications, however, should not attempt too much or they would accomplish nothing, for the subject must still be left largely open to study, investigation and experiment.

"There must be certain variation in the class of brick needed

for different situations. Frost will have its influence in the northern cities more than in the southern. Residence streets will not require as high a grade of material as business streets. And the heavy teaming of the metropolis will be more severe and demand higher qualifications than that of the smaller cities and towns. These variations in the requirements would not effect size or shape, however, as much as they do the other physical qualities which are essential to the durability of the brick.

"There is really comparatively little known about the essential qualities of paving brick which can be set down in specifications in such a manner that an engineer or inspector, unfamiliar with the material, can readily decide where the limit between a paving brick which is just good enough for use and one which is a little too poor for use should be drawn. Unquestionably both classes of brick are usually taken, to some extent at least, from the same kiln.

"All know that a first-class paving brick is a brick which, placed in the pavement, will stand the traffic for a long term of years without disintegration from frost or traffic. The difference between an unquestionably good and an unquestionably bad brick is wide and easily defined. The limiting case is where the difficulty arises.

"The question which remains to be answered is then how, in the limited time to be devoted to the construction of a pavement, can those qualities be unquestionably developed? The writer can not answer that question at this time and believes it is at present unanswerable. Will chemical analyses, or physical tests for compression, transverse strength, absorption or abrasion give the necessary information? Unquestionably they will in the extreme cases, but not at present in the limiting case; although they may ultimately do so when their relation to each other and to the wearing qualities of the brick are better known.

"What is necessary is to show the relation under various circumstances between the tests, which can readily be made and the actual staying qualities of the brick.

"The test for compressive and transverse strength undoubtedly has a value in determining the qualities of a brick, but just what relations there are between either one and durability is unknown. These qualities at present can hardly be claimed to define the limiting case. Neither can absorption be so considered. The writer is

familiar with brick, which, while absorbing four or five per cent. of water, will still withstand frost; while brick of a different manufacture, and made from a different clay, will go to pieces with frost if they absorb two or three per cent.

"The common rattler test is perhaps of more value than any other, if rightly conducted, as it comes nearer the actual condition of use. As often conducted, however, it gives little information. It is usually made under such widely varying circumstances as to be of no value whatever, as a means of comparison with other tests at other places. These tests are all of value as indicative of the general character of the brick, but do not define the limiting case. Uniformity in making these various tests, whatever the specifications might be, or however much they might vary, would certainly accumulate much valuable data which could in such case be compared. Much definite information would thus gradually be accumulated and definite conclusions could be ultimately drawn.

"The question of size and shape is believed to be largely a fanciful one and might in a general way be settled much more easily than the other qualities. Whether it should be settled in such a way as to secure a universal standard might, however, be open to serious question. If so, this would certainly be a long step in advance. Size, shape, physical condition as regards fire cracks, laminations, etc., can be more easily specified and their fulfillment determined.

"The desired relations between the various common forms of tests might be more quickly determined, or at least a great advance in this direction might be made, by a careful and exhaustive investigation of (1) the chemical character of various paving brick clays and its influence on finished brick; (2) the physical character of the same and its influence on the brick; (3) the methods of manufacture and the apparent influence of each operation on the finished product; (4) the physical qualities of the paving brick both first-class, medium and poor; (5) the results attained under traffic in widely different conditions and under different specifications, with also the careful test of both good, medium and bad brick, which have been long in use in the pavement, and the wearing qualities of which have been practically demonstrated.

"These investigations, if carried out on a broad scale, might develop facts which would lead to decided and definite results.

Such an investigation would, of course, be a matter of some considerable expense, and could only be undertaken by united action of those financially interested in the results. But if such an investigation were placed in the hands of a committee which could command the confidence of both the engineer and manufacturer, the results attained would have an authority which no standard, adopted without such thorough investigation, could ever have. Such an investigation would also materially aid in the immediate improvement of the product. For if the attention of the manufacturer could be diverted from the present necessity of changes in size, shape, and some other comparatively non-essential characters of the paving brick, to its manufacture, its durability might be steadily increased, and the cost of manufacture materially cheapened. As the best brick for the purpose is the desired end, surely manufacturers and engineers should be able to agree on reasonable uniformity in specifications if the true principles of manufacture and use can be determined.

"A movement for standardization is highly to be desired, and if not attempted in too radical a spirit, could not fail to be accompanied by good results."

CURRENT INFORMATION.

VITRIFIED BRICK AND ASPHALT IN TORONTO.

In the laying of permanent pavements in Toronto, the proportion of asphalt is increasing, and cedar block is correspondingly decreasing, having fallen from fifteen miles in 1890 to three miles in 1893. Brick has recently been introduced, the material having been imported from the United States, as there are no brick of requisite qualities made near Toronto. City Engineer Keating reports that the cost per lineal foot front, for a 24-foot roadway is about as follows: Standard asphalt, $3.80; light asphalt, $3.10; vitrified brick, on 4-in. concrete, $3.30; cedar block, on 6-in. concrete, $2.20; cedar block, on 6-in. sand, $1.10; granite, 6-in. concrete, $5.50.

The vitrified brick pavements in Toronto have been laid in streets which will subject them to the most severe tests that any pavement can receive there and they have been brought into comparison with Scoria blocks inside the street-car rails. Up to the time of the preparation of the report of the roadway engineer, Mr. H. D. Ellis, no evidence of wear was noticeable. In commenting upon the city's experiment in brick paving, Mr. Ellis says: "It is unfortunate that the home manufacturers have not yet been successful in producing a first-class paving brick. I believe the demand for this class of pavement will increase yearly, owing to the good foothold it affords horses, the ease with which it can be cleaned and repaired, and its non-absorbent qualities, making it preferable to either cedar block or broken stone."

Referring to the asphalt pavements in Toronto, Mr. Ellis says: "Owing to the rapid increase and growing demand for Trinidad asphalt pavements in this city, and the difficulty of obtaining reliable information as to the effect of weather and climate upon the different kinds of asphalt laid, and at the same time with a view of discovering why some of the asphalt pavements already laid were showing signs of cracking and disintegration under travel, I considered it advisable to have a continuous record kept of the asphalts and residuum oils used in the manufacture of the different asphalt pavements. Accordingly from time to time samples of the refined asphalt were taken from the stock on hand at the works of the various asphalt companies. Samples of their oils were also taken whenever new consignments were received. These samples of oils were carefully analyzed and examined for paraffines and other substances likely to be injurious to the pavement, also to ascertain their susceptibility to changes of temperature. The refined asphalt was examined to discover whether it was land or lake asphalt. Samples of the asphaltic cement were taken several times a day when the paving mixtures were being prepared, and subjected to a test for consistency. Finally, samples of the finished pavement were taken from the roadway and examined as to the admixture of as-

phaltic cement and sand in order to ascertain the regularity of the mixture."

The penetration test showed great irregularity in the asphaltic cement used in the surface mixtures upon some of the roadways. This is caused either by the variation in the quantity of oil added to the asphalt to form the asphaltic cement or by want of thorough mixing. The attention of the companies upon whose contracts this occurred was called to these irregularities, and steps will be taken to try and guard against them in the future. An irregular cement must form an irregular surface mixture, and with wear the pavements will become wavy and lumpy upon the surface, eventually wearing into holes where water will lodge and finally destroy the pavement. A regular system of analysis and examination of the asphalt and oils used in the manufacture of asphalt pavements should be kept up in all cities, so that the experience gained by success or failure in this class of work will be a guide for similar work in the future. The proper proportions in which to mix the various ingredients forming this class of pavement varies so much in different localities, according to the climate, amount of travel, quality and properties of the residuum oils and asphalt used, that what is suitable in one locality is not at all a fair criterion for use in another, and mixtures which may be perfect successes in one city may turn out failures in another.

METHODS AND COST OF ASPHALTIC PAVING IN TWELVE CITIES.

Mr. George Platt, city engineer of Erie, Pa., recently sent inquiries to fourteen different cities in regard to base, binder, cost, etc., of sheet asphalt pavements. He received replies from Capt. Fiebiger, Eng. U. S. A., Washington, D. C.; M. B. Cowden, City Eng., Harrisburg, Pa.; J. P. Phillips, C. E., Scranton, Pa.; W. R. Brown, C. E., Pittsburg, Pa.; H. P. Langworthy, Sec'y Bd. Public Works, Kansas City, Mo.; J. W. Twohig, Sec'y Bd. Pub. Works, Chicago, Ill.; N. J. Stanley, Chief Eng., Cincinnati, O.; Joseph Kinnear, C. E., Columbus, O.; H. D. Ludden, C. E., Detroit, Mich.; M. E. Rawson, Chief Asst. Eng., Cleveland, O.; S. J. Fields, C. E., Buffalo, N. Y.; Henry C. Allen, C. E., Syracuse, N. Y. The questions proposed are set forth, and the answers given by each city are indicated as follows:

What thickness of concrete do you lay?

Washington, 6 inches and 4 inches; *Harrisburg*, 6 inches: *Scranton*, 5 inches and 6 inches; *Pittsburg*, 4, 5 and 6 inches; *Kansas City*, 4 to 6 inches; *Chicago*, *Cincinnati*, *Columbus*, *Detroit*, *Cleveland*, *Buffalo*, *Syracuse*, 6 inches.

In making concrete do you use in addition to cement and sand, broken stone alone? Gravel alone? Or, if a mixture, what proportion?

Washington, half stone, half gravel; *Harrisburg*, broken stone alone; *Scranton*, broken stone alone: *Pittsburg*, broken stone and screenings; *Kansas City*, *Chicago*, *Cincinnati*, *Columbus*, *Detroit*, *Cleveland*, *Buffalo*, *Syracuse*, broken stone only.

Do you lay a cushion coat? If so, how thick?

Washington, *Harrisburg*, *Scranton*, *Kansas City*, *Cleveland*, *Buffalo*, no; *Pittsburg*, yes; *Chicago*, yes, ½ inch; *Cincinnati*, yes, ½ inch; *Columbus*, yes, ½ inch; *Detroit*, yes, ½ inch; *Syracuse*, yes, ½ inch.

Do you lay a binder course? If so, how thick?

Harrisburg, *Cincinnati*, *Detroit*, *Syracuse*, no; *Washington*, yes, 1½

inches when compressed; *Scranton*, yes, 1½ inch; *Pittsburg*, yes, 1½ inch; *Kansas City*, yes, 1½ inch; *Chicago*, yes, 1 inch; *Cleveland*, yes, ½ inch; *Buffalo*, yes, 1½ inch.

Is the binder material gravel or broken stone?

Washington, *Scranton*, *Pittsburg*, *Kansas City*, *Chicago*, *Buffalo*, broken stone. *Cleveland*, sand or gravel. (Balance of cities do not use binder course.)

What is the thicknesss of the surface after final compression?

Washington, 1½ inch, specifications read 2½ inches loose; *Harrisburg*, 2½ inches; *Scranton*, 1½ inches; *Pittsburg*, 1½ to 2 inches; *Kansas City*, 2 inches; *Chicago*, 2 inches and ½ inch cushion, total, 2½ inches; *Cincinnati*, ½ inch cushion and 2 inches asphalt; *Columbus*, 2½ inches (includes ½ inch cushion); *Detroit*, 2 inches above cushion coat; *Cleveland*, 2½ inches; *Buffalo*, 2 inches; *Syracuse*, 2½ inches (includes ½ inch cushion.)

What is your average price per square yard for sheet asphalt pavements as shown by the most recent contracts let?

Washington, 6-inch base, $1.68, 4-inch base, $1.53; *Harrisburg*, $2.75; *Scranton*, $2.58; *Pittsburg*, 4 and 5 inches, no binder, $2.49, 6 inches, with binder, $3.06: *Kansas City*, $2.58½; *Chicago*, $2.83 to $2.93; *Cincinnati*, $2.75; *Columbus*, $2.65; *Detroit*, $2.50; *Cleveland*, $2.85 to $2.95; *Buffalo*, $3.00; *Syracuse*, $2.43.

Does this price include grading, foundation and curbing?

Washington, *Harrisburg*, *Scranton*, *Pittsburg*, *Kansas City*, *Chicago*, *Cincinnati*, *Columbus*, *Detroit*, *Cleveland*, *Syracuse*, no. *Buffalo*, yes, but any grading exceeding 1 foot is paid for by the cubic yard. (This is the only city that includes curb in the bid the same as Erie.)

If not, what does it include beside the actual square yard of sheet asphalt?

Washington, simply base, binder and surface; *Harrisburg*, grading and foundation; *Scranton*, all but curbing—grading, foundation, remodeling street basins, raising or lowering man-holes, crosswalk and gratings; *Pittsburg*, the removal of the sub-grade; *Kansas City*, includes everything except curbing—that is, if the street has been graded, if not, the grading has to be done first by separate contract; *Chicago*, grading and foundation; *Cincinnati*, grading, rolling sub-grade, concrete and asphalt, or pavement complete, no curbing; *Columbus*, grading and foundation, curbing 40 cents per lineal foot extra; *Detroit*, concrete; *Cleveland*, foundation or concrete base only; *Syracuse*, includes the 6 inch course of foundation concrete laid.

Under what guarantee are your sheet asphalt pavements laid?

Washington, *Harrisburg*, *Scranton*, *Pittsburg*, *Kansas City*, *Chicago*, *Cincinnati*, *Columbus*, *Detroit*, *Buffalo*, 5 years; *Cleveland*, 10 years; *Syracuse*, 5 years generally, 10 years sometimes.

Please add any other remarks that you consider of interest.

Scranton—Former asphalt pavements laid in this city were composed of six inch concrete, ½ inch cushion, and 2½ inch wearing surface, at an average cost of $2.65 per square yard.

Detroit—Specifications have recently been adopted for Bermudez asphalt in which the cushion coat is omitted.

Cleveland—We have only a few streets paved with asphalt and all laid by the Warren-Scharf Asphalt Paving Co.

Syracuse—Petitions for "asphalt pavement of standard quality," under which all reputable pavements

may compete, are being circulated, and threaten to reduce the price of asphalt.

The replies further showed that all cities use broken stone alone, except Washington, which uses half gravel and half broken stone. All cities reporting, with one exception, Buffalo, do not include curbing in the bid for asphalt pavements. The average price in the 11 cities is $2.605, adding 24 cents per square yard for curbing, on a 30-foot roadway, would make the average price, including curb, $2.845. This average of $2.605 includes Washington, which has a very low price, but says it includes "simply base, binder, and surface," the grading being done under another contract or at an additional price. Curbing is not included in the bid in 11 cities, and is included in one, Buffalo. In 10 cities there is a five year guarantee, in one, Cleveland, a ten year, and Syracuse reports five generally, and ten sometimes.

RELAYING OF A BRICK STREET PAVEMENT.

Supt. Charles E. Fowler, Poughkeepsie, N. Y., has made a report regarding the relaying of a portion of the Cannon street pavement. Orr Brothers secured the contract at 35 cents per square yard for the old bricks and $1.65 per square yard where new bricks were used, and $5.50 per cubic yard for concrete. The report says:

"A section commencing at the easterly line of Liberty street and extending easterly about 182 feet, comprising the portion giving the most trouble from the rumbling noise, was taken up and relaid. The pavement on this section was taken up and the bricks cleaned from the loose mortar. The sand cushion was found to consist of very fine sand containing 35 per cent. of loam. The concrete foundation was carefully examined and found to be compact and firm, though not so hard as it should have been at its age. The surface was irregular. Owing apparently to the irregularities of the surface of the concrete and unequal sinkage of the sand cushion an uneven bearing was afforded to the brick pavement. The bricks in the pavement, being firmly cemented together, formed a continuous surface which rested upon comparatively small areas of the land cushion, leaving areas of considerable extent sustaining weight and having vacant spaces between their surfaces and the bricks. The depth of the vacant spaces was so small as to be scarcely perceptible, less than one-tenth of an inch, yet sufficient to permit vibrations and cause the hollow rumbling sound under passing vehicles. In reconstructing the old sand cushion was entirely removed and carted away. The concrete surface was made as uniform as possible, the bricks relaid upon a cushion of clean river sand and the joints filled with grout of Portland cement and sand in equal parts."

SEWAGE DISPOSAL AT BROCKTON, MASS.

The sewage disposal system at Brockton, Mass., was inspected recently, by a party of city officials, at the disposal fields, where several beds were examined, and on one of which the sewage had been running for about an hour. This was diverted and sent to the next bed in order to display the working of the gate system. The fluid is distributed over the whole surface of a bed by an ingenious arrangement, which was invented by Engineer

Snow and his assistants. Two of the assistants were on hand and helped the party to get an intelligent idea of the disposal beds. As soon as the fluid strikes the beds it begins to sink through the sand, and a few minutes later it is running through the underdrain, which is six feet below the surface, and is on its way to the Taunton river, having been purified while filtering through the sand. One of the beds was seen on which there had been deposited during the day a large amount of liquid. There was nothing whatever on the surface of the bed to indicate that it had been used. It is estimated that before the winter is over the system will be called upon to dispose of 50,000 gallons of sewage a day.

BRICK PAVING IN CLEVELAND.

In defense of brick pavements, E. E. Whitney, Cleveland, O., wrote a letter to the editor of the *Leader*, regarding a statement which appeared in that paper about December 7, and which was not altogether favorable to brick pavements. Mr. Whitney, in his letter, says:

"There is no better pavement in the world than brick, if it be of the right kind and properly laid. We have not had a street laid in a proper manner since Cleveland began to lay brick. The soft and poor brick which have been put into these streets are hardly fit for the inside of a house.

"The streets which have been paved in Canton, where they had a foundation, and where good brick were used, will stand any tire for fifty years. I know of one city where the brick have been laid for fifteen years, and they are good today. Take Euclid avenue, from Perry street to Cass avenue, and you will find that the stone pavement is fast giving way. Our city is so sandy that in order to have a pavement last, it must have a firm foundation and a good bed. The only pavement I have seen laid well and which will last was on Superior street about a year ago, where a foundation was made that will last for a century. Good fire-proof brick will last much longer than Medina stone brick, as they can be laid so much more even.

"If our brick streets could be laid on the principle on which Superior street was laid last year, and with good brick, we would have the best pavements in the world, and we would have no trouble with them for a quarter of a century. It is a shame and disgrace to the city of Cleveland to have such streets, after paying out such a large amount of money. Water street is almost impassable, and, if there were a good brick pavement laid there as there should be, it would stand for a half century. There is no street in the city which has such heavy traffic as Water street. Would it not be well for our city to try some place, and have a brick pavement laid as in Canton, and test the thing, so there would not be any more question about the future of brick pavements?"

VENTILATION OF SEPARATE SYSTEMS OF SEWERS.

At the New Jersey Sanitary Association, held at Asbury Park Dec. 7, Parker N. Black read a paper entitled: "Ventilation of Separate Systems of Sewerage." Mr. Black's claim in favor of the separate system is that water aids in, and stagnation is the most favorable condition for decomposition; that temperature and barometric changes are agents by which air is liberated from sewage; that any slight compression of air within a sewer is liable to break water seals, and

therefore a vent to relieve this pressure is necessary; that admission and circulation of fresh air is necessary; that fresh air will dilute the sewer gases to such an extent as to render them harmless; that proper gradients will remove sewage at such a velocity as to prevent decomposition and generation of gases within sewers; that sewer air found in well-ventilated sewers is slightly different from what is often found in badly ventilated dwellings; that the ventilation of the separate system of sewerage is safe and easy; that sewers will ventilate themselves if sufficient openings be made; that there is a constant flow of air in one direction or other through the perforated man-hole covers, in at one and out of the other, with a velocity of one to five feet per second; that the simplest, cheapest and most certain method of ventilation is to provide openings to the sewer at sufficient intervals and in a manner that will not require connection with additional pipes or shafts; that trouble is more likely to arise from house drainage than from sewers properly constructed and ventilated.

A STREET PAVING BOARD PROPOSED IN MILWAUKEE.

An important change in contemplation at Milwaukee, Wis., is the establishment of a street paving board which will embrace in its membership the city engineer and probably two other members of the board of public works. The duty of this board will be to pass upon and decide what streets shall be paved and the material to be used. It is claimed that a board thus constituted would add no expense in maintaining city government, while it would result in uniformity of street paving.

PAVING BRICK FAVORED BY CHICAGO.

The council sub-committee, appointed at Chicago to consider brick for paving purposes, favors a pure shale, repressed and thoroughly vitrified and 2¼ to 2½ inches thick, 4 inches wide and 8 to 8½ inches long and made from clays equal to those produced at Canton, O., and at Galesburg and Glen Carbon, Ill.

MEETING OF BRICK AND TILE ASSOCIATIONS.

The seventeenth annual convention of the Illinois Brick and Tile Association will be held at Springfield, Ill., January 15 and 16, 1895. The programme for the association is as follows: Address of Welcome, A. L. Converse, Springfield; "The Importance of the Clay Industries of the State," Hon. John P. Altgeld; "Burning Brick in Round Kilns," Frank Lawrence, Ray, Ill.; "Brick Making Fifty Years Ago," John McCabe, Rushville, Ill.; "Shall We Have a School for Future Clay Workers," Alex McLean, Trustee University of Illinois; "Experiences in the Manufacture of Brick and Tile," J. Will Anderson, Woodland, Ill.; "Tile Drainage in Different Soils," Experimental Station University of Illinois; "The Importance of Tempering Ware in Kilns," W. A. Eudaly, Cincinnati, Ohio; "The Management of Men," E. A. Curtis, Grant Park, Ill.; "Hard Roads," J. Dixon Doyle, Chicago; "Continuous Kilns for Drain Tile," Max Th. Boehncke, Centinela, Cal.; "Oil Burning in Round Kilns," discussion led by Wm. Hammerschmidt, Lombard, Ill.; "Let Us Keep Our Wares Before the Public by Having a Display of Raw Clay and its Manufactured Product Annually at the State

Fair in Springfield, Ill.," D. V. Purington, Chicago; "Paving Brick," Mr. Bronough, Virden, Ill.

The annual convention of the Iowa Brick, Tile and Drainage Association will be held at Des Moines, Iowa, February 6 and 7, 1895.

MEETING OF THE MASSACHUSETTS HIGHWAY COMMISSION.

The Massachusetts State Highway Commission held a meeting at Taunton December 4. President Perkins and Nathaniel S. Shaler were present. President Perkins, in reviewing the work of the commission during the last year, showed the following:

"Thirty-six pieces of road in all parts of the state were accepted upon which to begin work. Four or five sections of highway have been completed. In Bristol county pieces of road were taken in North Attleboro, where work is being done by the state. A road in Fairhaven is also being constructed, and preparations are being made to begin work on the road leading from Fall River to this city. Thirty-six contracts have been signed. In all cases the contracts have been made with the towns, but the commission appoints an inspector."

Mr. Perkins said: "It was hoped that many towns in the state would petition the commission. It is not the intention of the state to build boulevards, but to make transportation easier for the farmers. There are towns in the state from which, on account of bad roads, it costs more to haul produce to the nearest market than from Omaha to Boston."

George N. Goff, chairman of the selectmen of Rehoboth, advocated making the Providence and Taunton turnpike a state highway. It is probable that the whole or a part of the road will be adopted as a state highway in the near future.

STREET SPRINKLING IN TORONTO.

A sprinkler has been invented for the Toronto Railway Company, which has a tank holding about 3,000 gallons and will sprinkle ten miles of single track without refilling. It was at first arranged to sprinkle both tracks at once, but it was found that in the down town sections, where the time between cars is sometimes fifteen seconds or less, it was necessary to shut off when passing cars on the opposite track, which left dry places every few feet. The tank can be filled in five minutes, and the water is given by the city. The property-owners along eighty miles of streets pay 65 cents a day for four sprinklings.

A BITUMEN AND SAND MIXTURE FOR PAVING.

A communication received by the supervisors at San Francisco, Cal., recently from the president of the Santa Cruz Rock Pavement Company, gives information to the effect that a mixture of bitumen, with large quantities of sand, is being used in the paving of streets, which mixture is "very inferior for the purpose and its use will militate against the use of bitumen altogether as a pavement."

AMERICA'S MOST COMPLETELY PAVED CITY.

Columbus, O., has nearly one hundred miles of paved streets. Most of the street improvements have been made under the Taylor law, which distributes the cost over a term of years. The showing of paving up to the first of the year of 1894 is as follows:

	Miles.	Cost.
Trinidad asphalt	13.50	$763,384 78
Medina stone	4.17	397,322 85
Georgia granite	1.47	167,448 97
Greenfield stone	.27	19,087 66
Hallwood block, brick	28.34	1,269,412 92
Hayden block, brick	14.55	747,297 98
Red and fire clay, brick	23.61	1,018,605 32
East Clayton block, brick	.85	33,634 47
Kentucky rock asphalt	.82	39 564 33
Bowlder	4.40	45,038 84
Macadam	.22	3,504 50
Total	87.20	$4,504,300 00

	Miles.	Miles.
Total under "Taylor law"		87.20
Bowlder	5.05	
Stone block	1.20	
Brick	.13	
Hayden block	.18	
Asphalt	2.30	
Total under private contract direct assessment		8.86
or		
Total length improved streets in 1898		96.06

Columbus is ahead of other cities in giving a variety of paved streets to suit the character of the neighborhoods and in the general perfection of all the street work that has been done.

PROPOSED EXPENDITURES IN PHILADELPHIA.

A sub-committee on disputed items of the finance committee of Philadelphia councils has recommended a loan for permanent improvements of $2,400,000, as follows: Improved pavements, $500,000; bridges, $400,000; main sewers, $400,000; water extensions, $375,000; gas extensions, $225,000; new schools, $500,000. Among the items in appropriations for the Bureau of Highways, of which the chief is Mr. George A. Bullock, are the following: For paving intersections, $100,000; repairs to paved streets, $100,000; repaving and maintaining roads, $75,000; grading, $50,000; surfacing and resurfacing macadam roads, $100,000; for branch sewers, $225,000. The committee reports that the total indebtedness of Philadelphia is now $57,458,045, less sinking fund holdings of $25,390,021, leaving the net indebtedness $32,068,023. The assessed valuation of property owned by the city of Philadelphia is nearly sufficient to pay off the whole of the net indebtedness.

COST OF A ROCK CRUSHING PLANT.

A rock crushing plant for the making of road metal was established at Burlington, Vt., during the last year in the following expenditure:

Crusher	$600 00
Engine and boiler	530 67
Fittings	267 94
Freight and expressage	18 60
Labor	339 78
Carpenter services	205 35
Lumber	348 09
Miscellaneous	35 03
Total	$2,345 46

An accurate account of the operation of the plant showed that the crushing of 960 cubic yards of trap rock cost $1,481.86, delivered on docks in Burlington for shipment.

PLANS FOR STREET PAVING AT BURLINGTON, VT.

A plan for the paving of the streets of Burlington, Vt., has been prepared by W. S. Bacot, and an advisory board, composed of W. J. Van Patten, Guy Howard and Volney G. Barbour. It contemplates an expenditure of $400,000 for about thirty-four miles of paving, including 1.105 of asphalt, 5.192 of Telford, about 14 of 8-inch macadam, 6.320 of 6-inch macadam, and 6.879 of gravel road.

ADVANTAGES OF LETTING CONTRACTS EARLY.

The annual report of the board of public works, at Des Moines, Iowa, shows, for the last year's work and expenses, the following: Brick paving, 131,265 square yards, $205,036.76; curbing, 7,831 lineal feet, $3,201.41; sewers, 67,129 lineal feet, $149,223.92; grading of all kinds except contract, $3,655.61; grading by contract,

$9,128.35. Regarding the time of the year to let contracts, the board says:

"We found that the fact of these contracts having been entered into before or early in the winter was very beneficial to the city and the contractors as all parties could be in readiness to commence work as soon as the weather would permit. The result is that all the public work was completed early in the season. In consideration of the above mentioned experience we would most earnestly and urgently ask the council to provide for letting all the contract work for the coming season at the earliest date possible. We would suggest that each of the ward representatives determine how much in his opinion of curbing, paving, sewering, etc., should be done in the ward he represents during the season of 1895. After all these reports have been duly considered by the council, the board of public works be directed to advertise for proposals. This, in our opinion, should be attended to at once that the contracts can be let early in January, 1895. This will enable contractors to make their arrangements for material, etc., and be ready to commence work as soon as the weather will permit in the coming spring and complete their contracts early in the season. We feel assured that contracts can be let to very much better advantage in the city in January than in June."

COST OF STREET CLEANING.

Street Commissioner Jones, of Toronto, reports that the cleaning of the asphaltic pavements of that city by the patrol or orderly system, while a little more expensive than the old way, is more satisfactory. During the year, 1,302 miles of streets were cleaned, resulting in 155,988 loads of sweepings. The service cost $70,148.72.

ANOTHER PAVING EXPOSITION.

The Minneapolis Commercial Club has under consideration plans for holding a paving exposition. It will be similar in essential features to the one held in Indianapolis in 1890, under the auspices of the Commercial Club, with such marked success. The arrangements have not yet been completed, and the time for holding the exposition has not been definitely fixed, but it will probably be some time in February or March. Further information regarding it will be given in the next number of PAVING AND MUNICIPAL ENGINEERING.

NEW PUBLICATIONS.

A treatise on subjects of interest to municipal officers under the title "Public Works," has been issued in pamphlet form by Edward McCullough, C. E., of San Francisco. The pamphlet comprises nine articles, the general subjects of which are "Streets," "Health and Cleanliness," "Drainage and Sewerage," "Water Supply," "Surveys," "Plans," "Contracts and Work," "Municipal Ownership," and "Bonds." They were originally written for the trustees of a California town, giving an engineer's point of view of the various problems with which town trustees would have to deal. The pamphlet is offered for sale by Mr. McCullough, whose address is No. 511 California street, San Francisco, at 25 cents per copy.

The last annual report of Mr. E. H. Keating, city engineer of Toronto, is a practical illustration of intelligent and thorough organ-

ization in the supervision of public work, with efficient servants in execution. The report comprises concise and comprehensive reviews of the work done in each department prepared by the officers in charge, with valuable statistical data, maps, and illustrations. The report indicates no confusion of either duty or work, each distinct branch of service being under the charge of a man with the requisite qualifications, who is under the direction of the city engineer. Special features of the report are noticed at length elsewhere in this number.

Mr. George A. Bullock, chief of the bureau of highways, has had maps of Philadelphia substantially bound in leather, pocket size, for official use, including with it a summary of important statistics relating to municipal affairs.

PERSONALS.

Chas. A. Ewing has been elected village engineer at Evanston, O.

Chas. H. Nicolet has been appointed city engineer at La Salle, Ill.

H. C. Bruner, Pontiac, Ill., made a recent visit to Washington, D. C., on business relating to the patents covering his brick filler to street railway rails.

The new commission on streets and sewers, which came into power at Portland, Me., April 1, 1894, has effected a great reform in street work in that city. The commission consists of City Engineer Fernald, chairman, and Adam P. Leighton and John L. Brackett, with George S. Staples as street commissioner and active executive officer.

Robert S. Owen has been unanimously confirmed as a member of the board of public works, at Kansas City, Mo., to succeed the late Major Luin K. Thacher.

George N. Warren, of the board of public works, St. Paul, Minn., visited several Eastern cities recently to gather information regarding asphaltic pavements.

Frank Knight, of Crown Point, has concluded to abandon civil engineering and construction and make a specialty of contested property lines, surveying and real estate laws.

Mr. Allen Hazen read an instructive paper on "Notes on Foreign Water Supply," at the regular quarterly meeting of the New England Water Works Association, December 12.

Dr. Van Denbergh, of the Van Denbergh Laboratory, Buffalo, N. Y., has been retained by the town of Peterborough, Canada, in a litigation of some importance, involving the sewerage of the town of Peterborough and the pollution of the Otonabee river.

L. W. Rundlett, city engineer, and Mr. Warner, a member of the board of public works, at St. Paul, Minn., made a recent visit to various cities in the northwest, for the purpose of making a personal inspection of the different kinds of paving material in use.

President Hawley and E. W. Packard, of the Standard Asphalt Company, Bridgeport, Conn., entertained a number of prominent gentlemen recently, from Hartford, New Haven and Meriden, who wanted to examine asphalt pavements, the manufacture, and process of laying them.

LETTERS FOR THE PUBLIC.

PUBLIC WORK FOR THE UNEMPLOYED.

To the Editor of Paving and Municipal Engineering:

This city has just completed the construction of a stone sewer 5 ft. in diameter, at a total cost of $960. It has under construction one 2 ft. by 3 ft., which will cost about $1,100, and is 316 feet long with one man-hole. It has just authorized the construction of 140 feet of 4 ft. 2 in. by 6 ft. 3 in., 340 feet of 5 in. by 7 ft. 6 in., 60 feet of 3 ft. by 8 ft. and 360 feet of 24 in. pipe sewer. The city has done this work and is doing it for the purpose of giving employment to the needy laboring men who are residents of the city, and the only material purchased is the cement and pipe. The stone is found here in abundance, and the only cost is labor in getting it out. The sewers constructed are a part of the extensive system designed for this city in the year 1890.

J. M. James, City Engineer.
Sioux Falls, S. D., Nov. 29.

DIFFERENCE BETWEEN CAPACITY AND AREA OF SEWER PIPES.

To the Editor of Paving and Municipal Engineering:

I stand corrected by Mr. T. J. McMinn as to the difference between capacity and area of sewer pipes. In regard to finding the diameter of a single pipe equal in area to the area of several pipes, published October, 1894, in PAVING AND MUNICIPAL ENGINEERING, I unthoughtedly used the word capacity for area. However, there are instances, found by experiment, where main sewer pipes laid on the lowest ground are obliged to carry off considerable more seap water than is used in the district. In this case the capacity of pipes should be larger than provided for by Kutter's or Chezy's formulas.

F. R. Lockling, C. E.
Hannibal, Mo., Dec. 11.

THE PROBLEM AS TO THE SUMMIT OF GRADE.

To the Editor of Paving and Municipal Engineering:

In regard to Mr. H. Ward's solution (published September, 1894, in PAVING AND MUNICIPAL ENGINEERING) of my problem as to the summit of grade, etc. (published in July, 1894), I am inclined to say that his assumption will not solve my problem according to the data I have given. I may not understand his diagram, or he may not understand mine. His formulas are all right, so far as his assumption goes, but then he can never guess the correct distance x to the summit, s.

F. R. Lockling, C. E.
Hannibal, Mo., Dec. 11.

DISCOVERY OF BITUMEN IN IOWA.

About a year ago, while drilling a test well here to prospect for oil or gas, at a depth of 1,100 feet we passed through a strata of asphaltum. Its exact thickness we do not know. The tools we were using, a 6½-inch drill, with cable rig, were not suitable for testing, and our drillers struck it in the after part of the night. As they were looking only for oil or gas, they paid no attention to it until it clogged the bailer so that the dart

would not work and raise the valve in the bottom of the bailer. Its thickness is variously estimated at from 4 to 7 feet. It came to the surface in shining scales from one-sixteenth to one-eighth inch in thickness, and many scales an inch square. As there was a continuous flow of water from the well these scales floated to the top for several days after the drill passed through the strata. We drilled to a depth of 1,500 feet, when our contractor failed and work stopped.

We have not tested the asphalt at any other point but expect to do so next spring. It has been pronounced by our best chemists to be almost pure bitumen with a melting point, 70° F., above the Trinidad asphalt.

The form in which it was secured indicates that it lies in a solid strata, possibly with intervening layers of sand rock, or it may be without such intervening strata. It certainly does not exist as does that of Kentucky, in a porous sand stone, as in that case it would not have presented in such large flakes.

J. A. Noel.

Redfield, Iowa, Dec. 3, 1894.

MACHINERY AND TRADE.

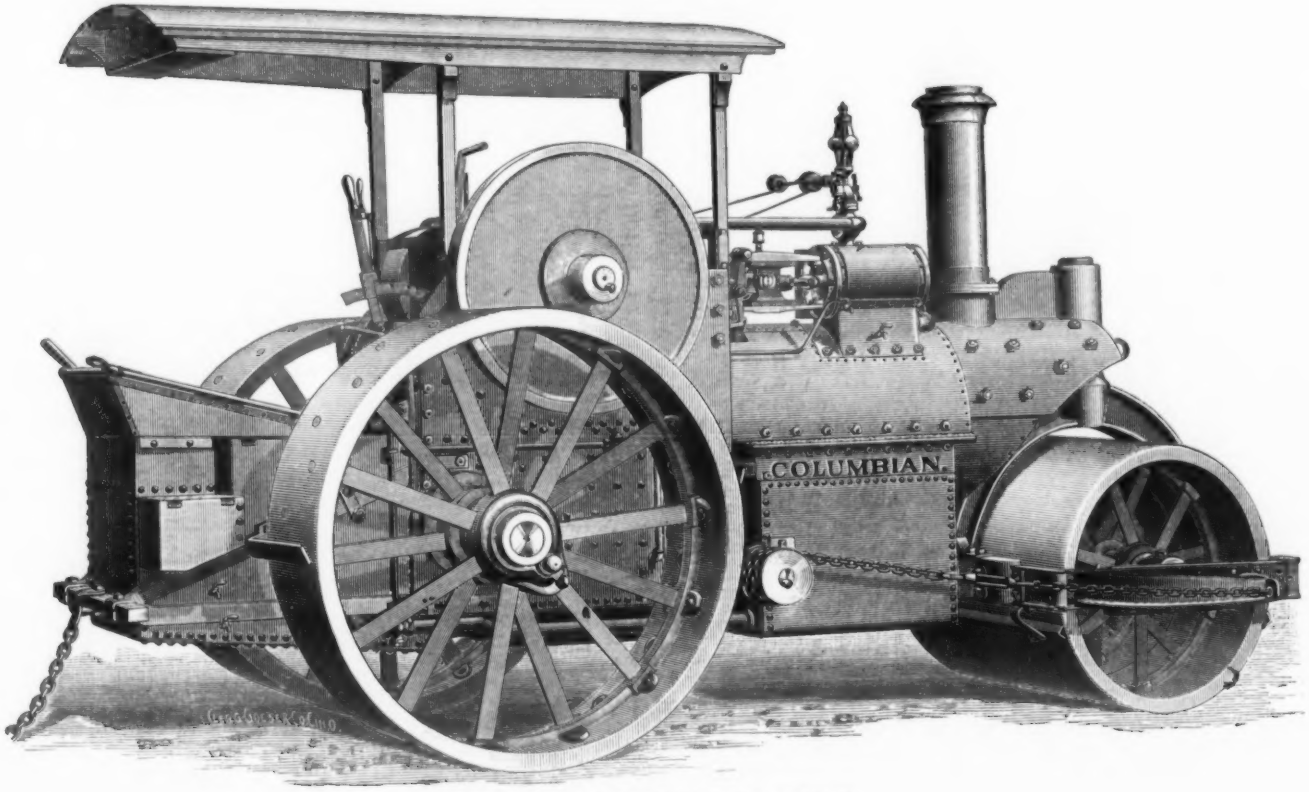
A NEW STEAM ROAD ROLLER.

A new steam road roller has been invented and put on the market by the Enterprise Manufacturing Company, of Columbiana, O. It is called the Columbian roller. The manufacturers claim for it simplicity and durability, with special mechanical principles and devices. They have three sets of patterns for different weight and size of rollers.

The boilers are made throughout with the best flange steel; the shell and fire-box plates are three-eighth inch thick, with heads and side extension plates one-half inch thick, all seems double riveted. The boilers are provided with a dome sixteen inches high and fifteen inches in diameter. The advantages of the dome are dry steam for the engine and increased steam capacity, with larger capacity of the boiler. It is placed near the middle of the boiler. The steam is taken from the top, which insures at all times dry steam in the engine. This is especially important, when going up or down grades, or when passing over sharp banks or gutters, and, it is claimed, avoids all danger of priming, thus rendering it unnecessary to have any dry pans or dry pipes inside of the boiler, where scales, or the use of impure water, usually make trouble. It is claimed that it also permits the carrying of water a gauge higher without a tendency to draw through the engine, giving the operator a little more to come and go on, or in other words, it does not necessitate carrying the water to such an exact height.

The front yoke is set fore and aft over the front roll instead of crosswise, as has been the practice heretofore. This yoke swivels at the center of a steel frame, which passes around the front roll at the center. The steel king-post is cast into the hub of the front yoke, which dispenses entirely with the swivel block, making a stiffer and more rigid swivel connection. It also allows the front rolls to pass over larger obstructions and uneven surfaces.

The ash-pan, it is claimed, is also an improvement, especially where



THE COLUMBIAN STEAM ROAD ROLLER.

close regulation of draught is required. Draught is admitted through a number of openings at the bottom of the pan, and a sliding damper, or a plate having a corresponding number of openings, rests on the bottom and is made to slide or shift to full opening or to close up tight, as required by the operator, and whatever draught is admitted is evenly distributed over the entire grate surface, causing the fire to burn uniformly over the entire fire-box and avoiding any black or dead places, as it does where the draught is admitted through side or end openings only. To clear the pan of ashes, the operator needs only to shift this sliding damper a few times back and forward in quick succession and all ashes drop out through these openings.

The rollers are supplied with two water tanks with large capacity. The one under the boiler extends out on each side 6 inches. The top of this projection forms a footboard, making it convenient for getting over the machine for oiling. On each side of the rear tank are fastened suitable boxes for carrying the spiking tools and attachments for picking up old road surfaces.

The engine is of the slide-valve pattern which is operated by link motion. The link and its connections are made of cast steel, especially large, to insure long life. The gearing is made of crucible steel and is made on the involute principle. The steering gear is a new and important feature, being simple and easy to operate. It consists of a sliding spool on the worm shaft to which is attached an eccentric operated by a lever, pressing either flange of the spool against the friction wheel, which is keyed on to the end of the engine shaft. A few pounds of pressure on this guiding lever is sufficient to guide the machine either to the right or to the left as desired.

The machine is provided with a substantial car, as shown in the accompanying illustration, or this is made to extend forward to within a few inches of the smoke stack, as may be preferred by the purchaser. Each roller is furnished with special wrenches, firing tools, oil cans, tools for spiking old road beds, etc. Further information can be obtained from the Enterprise Manufacturing Company, Columbiana, Ohio.

LARGE CONTRACTS FOR VITRIFIED BRICK AT JACKSONVILLE, FLA.

J. T. Sibley, of the Coaldale Brick and Tile Co., says that the contracts awarded in Jacksonville, Fla., for vitrified brick are the largest ever awarded in the South. "Jacksonville is the pioneer city in this line in the South," said Mr. Sibley. "It is true that Chattanooga has put down some vitrified brick paving, but the entire amount in that city is little if any more than the amount required for paving Main street. The new lot of brick, for which bids were opened yesterday, places Jacksonville on a par with any city in the country in the matter of vitrified brick paving.

TRADE NOTES.

R. Evans, Pontiac, Ill., contemplates the manufacture of brick.

The Brady's Run Fire Clay Works, Bridgewater, Pa., burned December 3.

James Florry, Rosemont, Pa., contemplates the erection of a brick making plant.

The McAvoy Brick Works, near Green Hill, Pa., contemplates important improvements.

It is probable that Erie, Pa., will have an asphalt plant and a paving-brick plant, next spring.

The brick and tile works of H. E. Taylor, Kankakee, Ill., were destroyed by fire, December 8.

An improved clay-grinding mill has been introduced by J. W. Penfield & Son, of Willoughby, O.

In and around Florence, Colo., a clay is found which makes an excellent quality of brick and tiling.

The United States Brick Co., of Chicago, contemplates establishing a large brick-yard at Lavernia, Tex.

The Oregon Vitrified Brick Company, Vancouver, Wash., has passed into the hands of a receiver.

An effort is being made at Atchison, Kan., to organize a new vitrified brick, tile and pottery company.

The Crown Fire Clay Company, Canal Dover, O., contemplates making some improvements in their plant.

Extensive improvements will be made in the machinery of the brick works of J. H. Ward & Son, Brinton, Pa.

The rubble paving stone factory, J. J. T. Wyatt, Faith, N. C., will be enlarged.

The Lehigh Fire Brick Works, Bethlehem, Pa., will be operated by McHose & Hunt. David Hunt will be manager.

A patent on a bridge has been granted Jason C. Fenn, at Peoria, Ill., assignor of one-half to W. E. Phelps, Elmwood.

The Sparta Brick and Tiling Company, Sparta, Mich., has been incorporated by Dwight M. Warner, Cornelius Clark and Leroy D. Buren.

The gravel plant north of Batavia, Ill., has been purchased by Thomas Snow, of Batavia, and Ben W. Dodson, of Geneva.

The Freeman Fire Clay Co., Toronto, O., has closed down the works in order to make extensive repairs to the plant.

The John H. Rich Sewer Pipe Works, and the Red Wing Sewer Pipe Works, Red Wing, Minn., will burn their pipe with oil.

Capitalists are investigating a potter's clay of superior quality, which has been located at Tamarack, Leidy township, Pa.

The Peerless Brick Company, Philadelphia, Pa., contemplates increasing its plant and putting in new engines and boilers.

The O. S. Kelly Company, Springfield, O., made a recent sale of a steam road roller to Bisbee & Foster, at Jacksonville, Fla.

The Excelsior Clay Works, Brazil, Ind., has been incorporated by J. J. Lynch, J. S. Smith, John Vanes and Harold L. Acheson.

A Bucyrus Tunnel Dryer is being put in for the Roseville Brick and Terra Cotta Co., Roseville, O., by the Frey-Sheckler Co., of Bucyrus, O.

The extensive brick works of Stewart & Co., near Beaver Falls, Pa., burned December 3. The loss on buildings, engines and machinery was $20,000.

The Galesburg Brick and Terra Cotta Company, Galesburg, Ill., contemplates putting in three repress machines and the erection of two or three kilns.

The Standard Brick and Terra Cotta Company, New Straitsville, O., suffered the loss, by fire, of their dry-house, engine-room and machinery, December 4.

A clay bed has been opened on the farm of Hiram Bartlett, Canaan, Conn., and he is negotiating with the Brick and Art Tile Company, of Clayton, for the sale of it.

Extensive repairs are being made to the plant of the Furnace Fire Clay Co., Salineville, O. The company contemplates putting in a large dryer, new engines and boilers.

The Shale Brick Company, Catskill, N. Y., contemplates purchasing ground and erecting works for the manufacture of tile from the same shale that the brick will be made.

The works of the Boston Fire Brick and Clay Retort Manufacturing Co., Boston, Mass., has been sold to the Boston Real Estate Trust. The operations of the company will still continue as heretofore.

From April 16 to October 29, the Berlin Brick Co., Berlin, Conn., has made 7,050,000 brick with a single machine, the "New Haven" horizontal, made by the McLagon Foundry Co., at New Haven, Conn.

The large building of the Rockyside Brick Works, near New Cumberland, W. Va., belonging to the Mack Manufacturing Co., was burned December 1. The works were among the best owned by the company.

A large flat-stone quarry has been opened at Millwood, Pa., the stone from which is exceptionally fine for paving purposes, and can be produced in any thickness and width desired and 25 feet in length. The stone is the same strata from which the Belgian paving blocks are made, being hard and durable, and with a clean, smooth surface. The quarry has been opened by Ankeny & Murphy.

Mr. F. G. Lotterer, of Ft. Scott, Kan., has guaranteed to the property-owners on National avenue, that he will purchase a street sweeper, if the council refuses to do so, provided the city will sweep the street whenever necessary.

The Best Brick Company has been incorporated at Mechanicville, N. Y., to manufacture building and paving brick. Directors, A. B. Orcutt, Jones B. Orcutt, Wm. N. Carey, Ezra M. Swartout and Harry E. Barton, of Mechanicville.

The entire plant of the Denver Paving and Press Brick Co., Denver, Colo., has been purchased by C. H. Coy, formerly secretary and treasurer of the company, and it will be known as the Coy Paving and Press Brick Co. New machinery will be purchased.

John Randall, of Detroit, Mich., has completed tests of brick clay. The vein found is believed to be the only outcrop of "Milwaukee" brick clay within a radius of 100 miles. The clay is quite unlike any found heretofore north of Saginaw Bay. It is easily worked, vitrifies at a low temperature and produces white brick.

Representative sewer pipe manufacturers of Ohio, West Virginia, and Western Pennsylvania met in Pittsburg to devise methods for effecting an improvement in prices. The re-establishment of the old tri-state organization is deemed advisable. The combination includes twenty-eight firms. It will be known as The Central Sewer Pipe Company, and will have headquarters in Pittsburg. The organization has a capital stock of $2,000,000.

The Consolidated Stone Companies has been organized at Bloomington, Ind., with a capital stock of $1,000,000. Capt. S. B. Voris, Col. A. C. Voris, W. H. Martin, Clint and Fred Norton are the incorporators. The corporation includes several valuable quarries in Monroe county and good stone land in Lawrence county. The deal will be in effect by January 1, 1895.

A new trolley wheel has been invented by Louis M. Erb, general manager of the Leavenworth Electric Railroad Company, Leavenworth, Kas. The wheel is provided with little brass discs, and when either disc becomes worn it is simply replaced by a new one, and the wheel is as good as new again. The discs can be manufactured and placed on the market at 10 cents each.

Application was made recently, by T. H. Montgomery, receiver of the Markle Fire Clay Company, of Markle, O., to sell real estate for the benefit of the creditors. The principal creditors are J. W. Penfield & Son, Willoughby, O., for brick machinery; B. Barrett, Son & Co., Wooster, O., engines and boilers, and James Means & Co., Steubenville, O., sewer pipe, press and pans.

A party of Pullman unemployed and their families, numbering 500 persons, have gone to Alabama, where they will start a single-tax colony on the Henry George plan, near Blakely, Baldwin county. They have secured 2,000 acres of fine land on the spot where the last battle of the civil war was fought. The land lies for two and one-half miles along the Tenshaw river, Brick making and sawmill machinery has been bought on time.

The Board of Public Improvements of St. Louis is inquiring into the comparative merits of California asphaltum and Kentucky bituminous rock, with a view to giving one of them a trial in St. Louis.

The *Contract Journal* of London says that the surveyor to the Chelsea Vestry expresses dissatisfaction with the Trinidad asphaltic paving recently laid in the King's road, which bears evidence of disintegration in places, presumably due to excessive moisture.

Extensive marl beds have been discovered at Bellefontaine, Ohio. W. R. Coney, who is interested, called upon the B. of A., at Cincinnati, and secured the promise of the members to go to Bellefontaine and inspect the marl with a view to giving it a trial in Cincinnati. The new company would like to bid on the Spring Grove Avenue improvement.

A new paving brick, for sidewalks only, has been invented. The brick will be one foot square and will be made of sewer pipe clay. One brick will cover as much space as 4½ bricks of the ordinary size. More ground can be covered in shorter time than with the old size, and it is claimed that they are more durable. A thorough test will be given them shortly.

A plant for the manufacture of bituminous pipe has been completed at South San Francisco, Cal., by the American Pipe Co. The pipe, it is claimed, is impervious to alkalies, acids, ammonia and atmospheric influences; tough, elastic and strong, and is a non-conductor, non-corrosive, non-frictional, non-explosive, pure and sanitary and free from sediment.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

W. A. Parks, Rochester, Pa., is laying a sample of brick pavement at Erie, Pa.

It is probable that concrete will be used hereafter for a foundation for pavements at Davenport, Ia.

Nearly one and a half miles of street was macadamized at Hammond, Ind., this fall, at a cost of $25,000.

It is thought that brick paving can be laid on the streets at Iowa City, Ia., at less cost than macadam.

The vitrified brick pavement on Washington street, at Easton, Pa., has been completed at a cost of $2,983 50.

A plan is being considered, at Danbury, Conn., for using the stone owned by the city in improving the streets.

The vitrified brick pavement on Barclay street has been completed to the West Seventh street line, at Chester, Pa.

The report of City Engineer Newton gives the amount and cost of brick paving done in Waterloo, Ia., during 1894, as $34,652.79.

Exchange street has been paved with New England pressed brick, at Providence, R. I. It is guaranteed to wear ten years.

Bituminous rock is to be used instead of basalt blocks for paving the roadway between the tracks on Folsom street, Berkeley, Cal.

About twenty miles of paved streets were constructed at Cleveland, O., during 1894, and this will be largely increased next year.

Seventh street, from Main to Vine, Cincinnati, O., will not be paved until spring. The Warren-Scharf Asphalt Paving Co., has the contract.

Paving specifications will be so amended, at Baltimore, Md., and Erie, Pa., as to admit Bermudez asphalt in competition with Trinidad asphalt.

The asphaltic pavement just completed on Powelton avenue, at Philadelphia, Pa., makes it the most attractive street in that section of the city.

About three and one-nalf miles of macadam paving will have been laid in Argentine, Kan., by next spring. Macadam is used exclusively as a paving material.

Topeka, Kan., has, of asphalt paving, 164,314 square yards; Colorado sandstone, 62,698 square yards; red cedar blocks, 34,-445 square yards; vitrified brick, 55,107 square yards.

An experiment will be made at Milwaukee, Wis., with vitrified brick for paving Mason street, from East Water to Jefferson, and if it proves satisfactory more will be provided for.

A resolution is before the city council at Ottumwa, Ia., requiring contractors to guarantee street paving for a period of seven years, the time when the last payment on paving becomes due.

The Ingham avenue extension of the Scotch road, at Trenton, N. J., has been macadamized in a very substantial manner. It has a Telford foundation seven inches deep, with five inches of macadam on top of it.,

The city council at Leavenworth, Kan., is considering the advisability of accepting vitrified brick, manufactured by the Pittsburg .Vitrified Brick Co., Pittsburg, Kan., with which to complete the Delaware street paving.

The township trustees of the various townships of Stark county met at Canton, O., December 11, to consider a plan of public road work. An association was formed last year, by the trustees for the purpose of arranging for a more perfect system of road work, and this last meeting was a session of the association.

The new tower bridge of London is paved with the wood of the eucalyptus tree from Australia. The blocks, which are about the size of building bricks, have beveled edges, which afford a foothold to horses. They are joined together by pegs which fit through them and fasten into corresponding holes in the adjoining blocks. The wood is of dark mahogany color, and while very expensive, is heavy and durable.

An ordinance will be passed by the common council, at Trenton, N. J., to the effect that no street paving will be laid during the time of the year when the frost is in the ground. A practical example of winter paving is said to be found in the new brick pavement on Montgomery street, where the material and workmanship has never been excelled in Trenton, yet the effect of the cold on the cement grouting will prove disastrous, it is feared.

During 1894 a total of $75,000 was expended for street pavements at Willamsport, Pa., as follows: West Third street, from Park to Walnut, asphalt, $42,000; Pine street, from Fourth to Third, brick, $2,800; Elmira street, between Fourth and Third, asphalt, $6,300; William street, from Third to Fourth, asphalt, $5,000; East Third street, from Mulberry to Pine, brick, $19,000. The city has also expended $25,000 for sewers during the year.

CONTEMPLATED WORK.

Fourth street, Santa Ana, Cal., needs paving badly.

A new seaside drive is proposed at Bridgeport, Conn.

Edgmont avenue, Chester, Pa., will probably be paved during 1895.

The paving of Thames street at Newport, R. I., is being agitated.

Jackson street, Columbus, Ohio, will be paved with asphalt or brick.

Coldwater, Mich., contemplates macadamizing a number of streets.

A brick pavement is contemplated for Mason street, Milwaukee, Wis.

Main street, the principal thoroughfare of Rockville, Mass., is to be paved.

Monroe and Halsey streets, Brooklyn, N. Y., will be repaved with asphalt.

Franklin avenue will probably be paved with vitrified brick, at Scranton, Pa.

A petition has been circulated at Menasha, Wis., for paving Naymut street.

A vitrified brick pavement is being agitated for Marion street at Elkhart, Ind.

The board of control at Cleveland, O., contemplates paving East Madison avenue.

An asphaltic pavement is being agitated, at Williamsport, Pa., for West Fourth street.

There is a movement at Jersey City, N. J., to have West Side avenue paved its entire length.

Brick, macadam and plank are being considered at Bradford, Pa., for paving Main street.

East College avenue and North West street will be paved next summer at Jacksonville, Ill.

The property-owners on sundry streets at Shamokin, Pa., are petitioning for asphalt pavements.

The property-owners along Ravine avenue, Peoria, Ill., will petition for an asphaltic pavement.

Property-owners on South Salina street, Syracuse, N. Y., are petitioning for an asphaltic pavement.

Vitrified brick is favored as a material for the proposed paving of Fifteenth street, at Jacksonville, Fla.

A brick pavement has been proposed for East College street, between Main and Pleasant, at Oberlin, O.

A vitrified brick or Belgian block pavement is contemplated for Farnsworth avenue, at Bordentown, N. J.

Lark street, from Madison avenue to State street, Kansas City, Mo., will be paved with vitrified brick.

The city council at Frankfort, Ind., contemplates paving the streets about the public square next summer.

An alley north of Third street, from St. Mary's to Clegg street, Dayton, O., will be paved with brick or asphalt.

Bay street, St. Augustine, Fla., is in need of paving. Central avenue will be paved from Church to Cerro street.

A number of alleys have been ordered paved, at Washington, D. C., with asphalt, asphalt block and vitrified brick.

Market street, the principal thoroughfare of Rockville, Mass., will be paved from Main street to the railroad station.

W. B. Ray, city engineer at Logansport, Ind., writes that petitions are being circulated for paving to be done next spring.

The paving of the asylum road, from the terminus of Frederick avenue, to the asylum, is being considered at St. Joseph, Mo.

The estimated cost of paving unpaved park drives at Philadelphia, is $200,000, and for new park asphalt foot-walks, $100,000.

The town council at Riverside, O., contemplates the issue of $15,000 in bonds for the purpose of improving the main highways.

The purchase of a stone crusher is contemplated at Marshfield, Wis., for use in the proposed macadamizing of Central avenue.

The property-owners on State street, from Twenty-seventh to Twenty-ninth, Milwaukee, Wis., have petitioned for an asphalt pavement.

Resolutions have been adopted at Erie, Pa., for paving Sassafras and Holland streets. The council also contemplate paving Chestnut street.

The board of public works at Kansas City, Mo., has approved ordinances for paving Oak street, from Eighteenth to Nineteenth, with brick.

The plans for the proposed extension of the streets and avenues, at Washington, D. C., have been favorably reported upon by Frederick Law Olmsted.

Genesee and Washington streets will be paved next year at Waukegan, Ill. A committee will visit other cities for the purpose of inspecting paving.

A resolution creating paving district No. 12 has been adopted at Ottumwa, Ia. It extends from the termination of the paving on Main street to Ash street.

The improvement of the streets at Scranton, Pa., is being agitated, and council is giving the matter its attention. The adoption of a wide tire is also advocated.

The contract for paving West Eleventh street, Erie, Pa., will probably be relet, owing to the assignment of the New Castle Block Asphalt Co., who had the contract.

The property-owners on Wellington street, Ottawa, Canada, are petitioning for an asphaltic pavement similar to the one proposed for Sparks, Bank and Rideau streets.

Some of the paving contemplated at Cleveland, Ohio, for 1895, is as follows: Dressed block stone, 38,243 feet; Medina stone, 15,737 feet; brick, 27,605 feet; asphalt, 475 feet.

The paving contemplated at Streator, Ill., for next spring includes Illinois, Hickory, Monroe, Sterling, Bridge, Kent, Elm and Watson streets, and an alley between Main and Bridge streets.

Commonwealth avenue, at Brighton, Mass., from Chestnut Hill avenue, to the Newton boundary line, will probably be laid out as a highway, and paved with gravel or other material.

Plans are being outlined at Rock Island, Ill., for paving in 1895, and contracts will be let so that work can begin early in the spring. The proposed work includes a number of streets and alleys.

A portion of Union street, between Ohio street and Montgomery avenue, Pittsburg, Pa., will be paved with Sicilian asphalt, and the lower portion of the street will be paved with ligonier block stone.

The property-owners in the vicinity of North Capitol and First streets, N. W., Washington, D. C., have formed a permanent organization for insisting upon the improvement of the streets in this section.

The proposed street improvements for 1895, at Cleveland, O., embrace the following: Dressed block, 128,783 square yards; Medina stone, 55,927 square yards; brick, 87,462 square yards; asphalt, 3,459 square yards.

Winnipeg, Man., contemplates paving Main street with cedar blocks, brick or asphalt, and invites correspondence from manufacturers with prices and samples of brick and asphalt. The work includes about 30,000 square yards.

Several streets are to be paved at Brooklyn, N. Y. Estimates made are as follows: Hart street, $4,200; Watson street, $13.000; Madison street, $8,800. A resolution has been offered for paving Snedeker avenue, at a cost of $29,500.

The street paving question for next year is being discussed by the press at Utica, N. Y. An asphaltic pavement for Varick street, from Columbia street to Sunset avenue, is advised. Also the paving of Court street and the repaving of Genesee street.

Measures have been introduced, at Philadelphia, Pa., for repairing, as follows—vitrified brick, Lorraine street, from Spring Garden to Green; Belgian blocks, Spring Garden, from Sixth to Seventh, and Wood street from Sixth to Tenth; sheet asphaltum, Depot street, from Eighth to Ninth.

The city engineer at Toronto, Can., has renewed his recommendation for repairing with asphalt or vitrified brick the track allowance between the Blorr and Davenport roads, and with cedar and granite on concrete, the track allowance between the Davenport and the C. P. R. tracks.

Street paving ordinances adopted at Peoria, Ill., provide for paving the following streets: With brick, Spring, Fifth, Sixth, Commercial, Prairie, Liberty, Third, and Madison streets. With asphalt, Madison, from Hamilton to Cornhill; North Jefferson, East Park Place, Park Place, West Park Place and Hamilton streets.

The plans for the proposed improvement of Douglas boulevard, Chicago, Ill., show two 40-foot driveways, a 20-foot bicycle path, a 20-foot bridle path, a 20-foot lawn between the southern driveway and bicycle path, a 6-foot lawn between the bicycle and bridle paths, a 54-foot lawn between the bridle path and the northern driveway, and two 12-foot strips of lawn separating the driveways from the 8-foot walks.

An ordinance has been offered at Montgomery, Ala., for specifications and estimates for paving with brick on a concrete foundation, Court street, from Church to Jeff Davis avenue. The ordinance was so amended as to include Monroe, Lawrence, and Court street, from Tallapoosa to Coosa street. Estimates have been ordered for paving with brick, on a concrete, sand, or gravel foundation of four inches, Madison, Lawrence and Montgomery streets.

CONTRACTS TO BE LET.

Bids for paving Water street, at Sandusky, O., will be readvertised.

Bids will be received at Louisville, Ky., until Jan. 4, 1895, for paving Garland ave.

The city council of Ottawa, Canada, invites bids until Jan. 25, for the different kinds of asphalt paving proposed to be constructed during 1895.

Bids are invited until Jan. 15, 1895, for curbing and guttering 800 feet, on both sides of Main street, Le Sueur, Minn.

Bids are invited, at Orange, N. J., until Jan. 7, 1895, for flagging the northerly sidewalk of Alden street, and the easterly sidewalk of Mt. Vernon ave.

Bids will be opened at Houston, Tex., at the last meeting in January, 1895, for paving Willow and other streets from the San Jacinto street bridge to Lyons avenue.

Sealed proposals will be received at Batavia, O., until Jan. 15, for furnishing material and constructing free pikes, as follows: Laurel and Lindale free turnpike, one-half mile; Neville and Penn Schoolhouse free turnpike, one-half mile; Cedron and Bull Skin free turnpike, one-half mile; Hartman's School-house free turnpike, two miles; Batavia and Back Run free turnpike, one mile; South Milford free turnpike, one-half mile; Perintown free turnpike, one mile; Moscow and Laurel free turnpike, one-half mile.

CONTRACTS AWARDED.

Carson & Hutchinson secured the contract for paving Sample alley with vitrified brick, at Pittsburg, Pa.

The Barber Asphalt Paving Co. was awarded the contract for paving Main street for $33,300, at Pittston, Pa.

J. E. Voorhees & Co., of Terre Haute, Ind., secured the contract for paving Ohio street, in that city, with rock asphalt.

Hussey & Brown secured paving contracts at Georgetown, Washington, D. C., as follows: Alleys in squares 777, 83, 273, and 11,112, vitrified brick or block, 68 cents per square yard; alleys in squares 140, 4, 362 and 628, asphalt block, 53 cents per square yard.

Paving contracts have been awarded at East St. Louis, Ill., as follows: Eighth street, from Broadway to St. Louis avenue, Francis McCabe, St. Louis, Mo., Wabash repressed block, $1.28; Eighth street, from St. Louis avenue to Exchange avenue, Francis McCabe, Wabash brick, $1.28.

W. B. Ray, city engineer at Logansport, Ind., writes that nearly four blocks of brick paving have been put in on Fourth street, by the Talbot Paving Company, of Detroit, at a cost of $1.27 per square yard for paving, 60 cents per lineal foot for curbing, and 72 cents per lineal foot for circular corners. The Poston block pavers, manufactured by the Wabash Clay Company, were used. About nine blocks of limestone macadam, with stone screenings, have also been completed by S. Casparis, of Columbus, Ohio. This was done at 60 cents per foot, front, one-half the width of the street, or $1.20 per foot, front, the full width of the street.

The contract for paving North street with vitrified brick, at Caldwell, Ohio, has been awarded to William Young, for $4,-119.88.

SEWERS.

Fuel oil in sewers has been declared a nuisance by the health board at Detroit, Mich.

The cost of the sewer system, complete, at Watertown, Wis., is $65,272.87. McCann & McLellan were the contractors.

About 117 feet of the Spruce street sewer, just completed at Middletown, Pa., is built of 4-inch wall and the remainder of 9-inch wall. It is 202 feet long and 5 feet in diameter, and is considered the most excellent piece of work ever done in the city.

The sewerage system being constructed at New Orleans, La., is progressing satisfactorily. The main conduit has been laid and the main sewer and pumping station construction will be pushed. The enormity of the work is only apparent to those immediately interested in it. Owing to the lowland situation, the undertaking had always been considered impracticable. A Moore hoister and conveyer is being used in the work.

CONTEMPLATED WORK.

A sewerage system is being agitated at York, Pa.

A trunk sewer will be built through Belmont, Mass.

The sewerage question is being agitated at El Reno, O. T.

A system of sewers is being talked of at Hightstown, N. J.

The sewerage question is being discussed at Champaign, Ill.

A sewerage system is contemplated at Oconomowoc, Wis.

An outlet sewer will be built at Bath, Me., next summer.

The need of sewers is being urged by the press at Quincy, Mass.

Plans are being made for a sewerage system at Farmington, Ill.

Elkhorn, Wis., contemplates establishing a sewerage system.

The sewerage question is being agitated at Sea Cliff, L. I., N. Y.

Bonds will be issued at Jefferson City, Mo., for building a main sewer.

Plans are being made for the proposed sewerage system at Williamsbridge, N. Y.

The village of Charlotte, N. Y., contemplates the construction of a sewerage system.

Palatka, Fla., will vote upon a proposition to issue bonds for putting sewerage in the city.

Plans are being made for a system of sewers at Two Rivers, Wis., by W. S. Shields, Chicago.

The sewerage system in the Third ward, East Orange, N. J., will be extended at a cost of about $9,000.

A petition is being circulated at Boulder, Colo., for the construction of a sewerage system in the spring.

Youngstown, O., contemplates expending $40,000 or $50,000 for sewer work, to give employment to the poor during the winter.

Resolutions providing for lateral sewers, in Lacock and Benton streets, and an ordinance for one on Davis street, have been approved at Allegheny, Pa.

Sewers will be constructed at Troy, N. Y., as follows: Pipe sewer, 20 inches, in President street, from Smith avenue to Bond street, thence on Bond to the Hudson river; pipe sewer, 12 inches, in President street, to extend 225 feet to Douw street, to connect with the Douw street sewer.

An improvement in the outfall sewer is being considered at Los Angeles, Cal. It is the construction of a suitable grating where the settling chamber discharges into the wood siphon running beyond there, which, if done, would prevent large bodies, such as tend to obstruct the way, from being accidentally or otherwise carried into the wood pipe.

CONTRACTS TO BE LET.

Sealed proposals will be received at Albany, N. Y., until January 7, 1895, for constructing a vitrified pipe sewer in Bradford street.

CONTRACTS AWARDED.

Sanford, Brooks & Bosel have the contract for sewering the city of Portsmouth, Va.

P. A. Donnell, Pittsburg, Pa., was awarded the contract for constructing a lateral sewer on Howard street.

Campbell Bros., of Cleveland, O., were awarded the contract for the Red Run sewer system at Warren, O.

Nicholas Beckrick, Tonawanda, N. Y., was awarded the contract for constructing the sewer system at Cazenovia.

The contract for building a sewer in Thirteenth street at College Point, N. Y., was awarded to Thomas R. Sullivan.

The contract for constructing a sewer in N. Main street, at Pittston, Pa, was awarded to Lindsey & Van Loon, of Plymouth.

The contract for constructing a sewer to relieve one on Seaview avenue, Bridgeport, Conn., has been awarded to the B. D. Pierce, Jr., Co., for $4,000.

Henry Starkweather was awarded the contract at Ashtabula, O., for constructing sewers in Maine, Park, Prospect, Lake, Vine, Spencer, Tod and Division streets.

The contract for building a 15-inch pipe sewer in Lillie street, Newark, N. J., was awarded to Michael Condon; in Third street and Fairmount avenue to James McGuire.

Contracts for sewer construction have been awarded at Rochester, Pa., as follows: Friedrich Park, pipe sewer, H. N. Cowles, $530.80; Bernard street, pipe sewer, E. L. and H. T. Oliver, $2,004.80.

Contracts have been awarded at Allegheny, Pa., as follows: Main sewer in Morgan, Lacock and Voegtly streets, in fourth ward, James H. McQuaid, $3,452; lateral sewer under the south sidewalk of Spring Garden avenue, B. McParland, $864; lateral sewer on Bluff street, Sowders and Houston, $1,106.

Sewer contracts have been awarded at Hamilton, O., as follows: Sanitary district No. 1, contract No. 2, Greenville Construction Co., $12,792; Sanitary district No. 1, contract No. 3, Greenville Construction Co., $7,369.50; Sanitary district No. 1, contract No. 4, Walker & Robinson, $8,736.10; Sanitary district No. 3, contract No. 2, W. H. Louthan, $6,885.30.

WATER-WORKS.

Bids are invited until January 15, 1895, at Brightwood, Ind., for building a water-works plant.

Bids will be received until January 10, 1895, at Decatur, Mich., for constructing a water-works system.

Plans are being prepared for water-works, as follows: Port Clinton, Ohio; Carrollton, Ky.; Orion, Mich.

A company will be organized at Mahaffey, Pa., in January, 1895, for the erection of a water-works system which will cost about $15,000.

The citizens of Millville, Pa., voted, Dec. 4, to purchase or build water-works, under the provisions of the general State law, passed in 1876.

Sealed proposals will be received at Corry, Pa., until February 1, 1895, for the construction of water-works and for supplying the city with water for fire service.

The $3,000,000 of water-works bonds, at Kansas City, Mo., were sold, Dec. 10, to Blair & Co., of New York. This will enable the city to comply with the order for the purchase of the system.

BRIDGES.

The bridge across the Kaw, at Turner, Kan., is completed.

Plans are being formulated at Astoria, Ore., for a bridge across Young's Bay.

A new bridge will be built over the Solomon river west of Solomon City, Kan.

Plans are being made for a new bridge to span the Tennessee river at Knoxville, Tenn.

The citizens of Croswell, Mich, want another bridge constructed across Black river.

It is estimated that more bridges will be built during the next three years than for the past ten years.

A free county bridge is contemplated across the Ohio river between Coraopolis and Sewickley, Pa.

The city council at Dubuque, Ia., are considering the matter of making the high bridge a free bridge.

A new iron bridge is proposed at Atlanta, Ga., to replace the Jones avenue bridge, which is deemed unsafe.

The aldermen of Menominee and Marinette, Wis., favor the erection of an iron bridge between the two cities.

A bridge will be built across the Maumee river at Maumee, O., by the Toledo and Maumee Electric Railway Co.

The Indiana Bridge Company, Muncie, Ind., has built a new iron bridge across Cool Creek, near Carmel, Ind.

Plans are invited for a bridge across the Erie canal, on the line of Porter avenue, until Jan. 8, 1895, at Buffalo, N. Y.

Bids will be opened January 7, 1895, for constructing a new bridge over Swan creek at Perry street, Toledo, Ohio.

A strong, substantial viaduct of iron and stone, to replace the present bridge at Main street, is advised at Dayton, O.

A bill has been passed by Congress, authorizing the construction of a wagon bridge across the Red river, at Grafton, N. D.

The commissioners of Ohio and Marshall counties, W. Va., have decided to build a steel highway bridge over Big Wheeling creek.

Bids are invited until January 5th, at Bay City, Mich., for constructing a protective pier to the Twenty-third street bridge.

The contract for building a bridge across the Mahoning river, at Warren, O., was awarded to the Variety Iron Works, for $7,839.44.

The residents of Will county, Ill., have petitioned the drainage board for a bridge over a channel cutting, on the road to Lockport, Ill.

An effort is being made at Jefferson City, Mo., for an amendment to the bridge charter, asking that a low drawbridge may be constructed.

Broadway bridge, at Milwaukee, Wis., has been found too weak to be turned by electricity, and a new bridge is proposed for the near future.

A favorable report has been made upon the proposed erection of a county bridge over Conestoga creek, in East township, near Lancaster, Pa.

Sealed proposals will be received until January 8th, at Houghton, Mich., for the construction of an iron or wooden bridge across Portage lake.

Proposals are invited, at Natchez, Miss., until Feb. 4, 1895, for the construction of a steel bridge over the Homochitto river, at Swayze's Ferry, Miss.

The new bridge across the Wisconsin river at Muscoda, Wis., has been completed. It is a steel draw, 1,000 feet long, and rests upon a stone foundation.

The board of public works at Denver, Colo., contemplates the construction of a new bridge across Cherry creek, at Broadway street. It will be a deck plate bridge.

The county commissioners at Elkhart, Ind., have been petitioned for a new bridge to replace the Decamp bridge. A bridge is also needed across the channel at East Franklin street.

The location of the up-river bridge at Toledo, O., will be at Fassett street and Walbridge avenue. It will probably have thirty-two feet of roadway, with six-foot sidewalks on either side.

Measurements have been made at Davenport, Ia., for a new bridge to be built upon the piers which support the present bridge across the Mississippi between Davenport and the government island at Rock Island, Ill.

A petition has been filed with the county commissioners, at Watsontown, Pa., asking them to act in conjunction with the commissioners of Union county, in rebuilding the old bridge at Allenwood, which was swept away by a flood in 1894.

The streets and bridges committee at Scranton, Pa., have awarded contracts as follows: Linden street bridge, asphalt flooring, Edge Moor Bridge Company, $72,-100; Roaring brook bridge, asphalt flooring, Phœnix Bridge Company, $87,345.

The commissioners of Vermillion Parish, and the town authorities of Abbeville, La., contemplate uniting in the construction of an iron bridge to replace the wooden bridge now at Abbeville. The estimated cost of the proposed bridge is $10,000.

PARKS.

Casey, Ill., is to have a park.

A park is contemplated for Nazareth, Pa.

A new park is contemplated at Terre Haute, Ind.

A park and driveway system is being agitated at Quincy, Ill.

An effort is being made at Canon City, Colo., to establish a fine park.

More land is being acquired at Minneapolis, Minn., for park purposes.

The park board at Peoria, Ill., has secured more ground for park purposes.

By the will of the late Henry Keney, Hartford, Conn., will have another fine public park.

The citizens of Newburg, O., are agitating for a park on the line of the proposed extension of Fleet street.

The city council at Fremont, Neb., are considering the purchase of the Chautauqua grounds for a public park.

The question of purchasing the site of the old Fort Massachusetts and converting it into a public park is being agitated at Pittsfield, Mass.

The plans for beautifying Hitchings field, Malden, Mass., have been accepted by the park commissioners. Olmstead, Olmstead & Eliot made the plans.

Grounds have been bequeathed the trustees of Norway, Ia., by the late Rev. J. J. Lenhen, for a public park. Steps are being taken towards improving it.

A park will be made of the court-house yard at Owensboro, Ky. Smaller trees and shrubbery will be planted, a gravel walk constructed, some statuary and possibly a fountain placed in it.

A feasible scheme is contemplated at Pittsburg, Pa., which will, if carried out, give Schenley Park an extensive aquarium. By damming brooks, pools and lakes a perfect home can be made for fish, it is thought.

A public park is proposed on and about the premises of the Eustis-street burying ground, at Roxbury, Mass. The burying ground, which is of historical interest, has fallen into a neglected and dilapidated state. and the establishment of a park will, it is thought, create more local patriotism and respect.

The State Forest Commission, at a meeting, December 14, at Albany, N. Y., provided for the establishment of a state park in the Catskills. It is situated near Slide Mountain, and contains 36,000 acres. A deer park was established near Slide Mountain several years ago. The commission also provided for the purchase of lands within the Adirondack state park, in Warren and Hamilton counties, which will contain more than 7,000 acres.

STREET LIGHTING.

Electric lights have been suggested for Hardin, Ky.

Dell Rapids, Ia., contemplates securing an electric light plant.

Electric lighting is contemplated for the streets at Fayetteville, N. C.

The electric light question is being agitated at Trumansburg, N. Y.

The establishment of an electric light plant is contemplated at Lowellville, O.

Fred W. Richart, Carbondale, Ill., has the contract for installing a 500 light A. C. plant for Wright Bros., at Vienna, Ill.

A. B. Hart, chairman of the electric light committee of the common council, Henderson, Ky., would like to correspond with electric light companies, with a view to putting in an electric light system.

MUNICIPAL BONDS.

Bids will be received at Springfield, O., until January 15, for $4,367.23 of 6 per cent. bonds.

Bids are wanted until January 17, at St. Bernard, O., for $6,321.40 of 6 per cent. bonds.

Bids are invited until January 12, at Astoria, Ore., for $200,000 of 5 per cent. water bonds.

Sparta, Wis., will offer for sale, July 1, 1895, $50,000 of 5 per cent. court-house bonds.

Bids are invited at Covington, Ky., until January 14, for $8,000 and $12,000 of 5 per cent. bonds.

Bids are invited until January 9, 1895, at Cleveland, O., for the purchase of $200,000 of 4 per cent. bonds.

Bids will be received at Madisonville, O., until January 5, 1895, for the purchase of $5,983.50 of 6 per cent. bonds.

Bids will be received at Pleasant Ridge, O., as follows; January 15, for $3,814.30 of 6 per cent. bonds; January 18, for $3,000, $7,352.71, and $3,170.98 of 6 per cent. bonds.

SEALED PROPOSAL.

WATER AND LIGHTS.

The city of Corry, Pa., will receive bids up to February 1, 1895, for the construction of waterworks, also supplying the city with water for fire service; also for street lighting with arc lights. For further information address

COL. T. A. EDWARDS, Corry, Pa.

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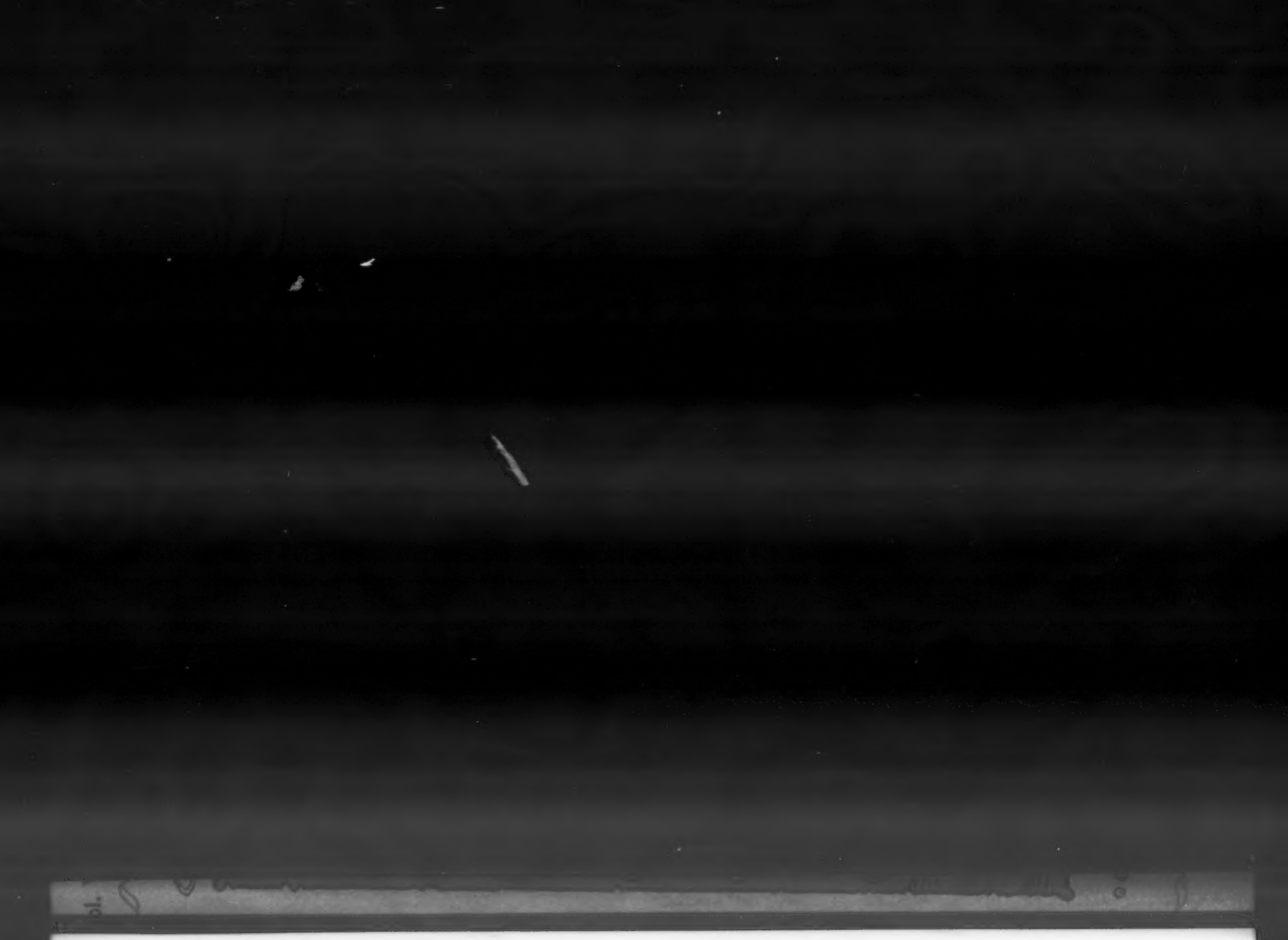
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